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CONTENTS

THE WHOLE OF THE LITERARY MATTER IN THE LANCET IS COPYRIGHT

ADDRESSES AND ORIGINAL ARTICLES

Concomitant Squint and its Treatment. By L. H. SAVIN, F.R.C.S. 523

Disturbances of the Body Temperature. II. By C. E. LAKIN, F.R.C.P. ... 526

Filarial Periodicity. By G. CARMICHAEL LOW, F.R.C.P., and P. H. MANSON-BAHR, F.R.C.P. Laboratory Report by A. H. WALTERS—(*Illustrated*) 531

Exophthalmic Goitre with Deep X Ray Therapy. By E. P. POULTON, D.M., and W. L. WATT, M.D. 535

Vaporised Iodine with Bier's Modified Hyperæmia in Treatment of Pyogenic Cutaneous Affections. By ALBERT STRICKLER, M.D.—(*Illustrated*) 537

"Curious Bodies" Found in the Lungs of Coal-workers. By ENID WILLIAMS, M.D.—(*Illustrated*) 541

CLINICAL AND LABORATORY NOTES

The Nature of Henry's Reaction in Malaria. By R. HOWITT WISEMAN, M.B. 543

Carcinoma of the Œsophagus with Fistula into the Air-passages. By W. G. SCOTT-BROWN, F.R.C.S.—(*Illustrated*) .. 544

Bacillary Dysentery due to Flexner, Type "Z," Presenting some Unusual Features. By S. D. MCCLEAN, M.R.C.S., and FRANK MARSH, M.D., D.T.M. & H. 545

REVIEWS AND NOTICES OF BOOKS

Industrial Maladies. By Sir Thomas Legge, M.D., D.P.H. 546

Die Postoperativen Pneumopathien. By Prof. C. Henschen 546

Nature and Nurture. By Prof. Lancelot Hogben, D.Sc. 547

A Synopsis of Hygiene. By Prof. W. W. Jameson, F.R.C.P., and Lieut.-Col. G. S. Parkinson, M.R.C.S., D.P.H. 547

A Short History of Some Common Diseases. Edited by W. R. Bett, L.R.C.P. 547

The Atom. By John Tutin, D.Sc. 548

British Journal of Children's Diseases 548

LEADING ARTICLES

THE WORLD WE LIVE IN. 549

TUBERCULOSIS AMONG NURSES 549

THE CAUSATION OF SQUINT 551

OUR ELDERS AND BETTERS 552

ANNOTATIONS

Aeroplanes as Carriers of Infectious Disease 553

In Memory of Theodore Williams 552

Medical Examinations in Dusty Industries 553

Children in the Alps 554

Mr. Serjeant Surgeon Knight 554

Acetylcholine in Rheumatism 555

A Pioneer of Cancer Research 555

Skin Diseases of Dogs 556

The Diagnosis of Pernicious Anæmia 556

PROGNOSIS

XVII.—Prognosis in Epilepsy. By C. M. HINDS HOWELL, F.R.C.P. 557

SPECIAL ARTICLES

The Urea-clearance Test. By E. HINDEN, M.R.C.P. 558

British Medical Association: Section of Surgery: Physical Efficiency after Operations for Hernia .. 562

Section of Radiology and Electrotherapeutics: Radiology as an Aid to the General Practitioner 564

Section of Public Health: Immunisation in the Prevention of the Specific Fevers.—Modern Sanatorium Treatment 566

United States of America: A Notable Health Survey 568

Paris: Of What Do Parisians Die?—Medical Plethora and a Proposed Remedy.—Systematic Medical Supervision of Medical Students and Nurses 569

Ireland: A New Public Health Measure 570

Infectious Disease in England and Wales 570

CORRESPONDENCE

Extraperitoneal Ovarian Graft Cyst (Mr. H. A. Kidd, F.R.C.S.) 571

Acriflavine for Schistosomiasis (Dr. M. A. El Moneim el Diwany) .. 571

Vaccines in Peptic Ulcer (Dr. J. N. Gale) 572

Perspiration Sensible and Insensible (Dr. J. T. Irving) 572

John Knight, Serjeant Surgeon 572

NEW INVENTIONS

An Angle-piece for Magill Endotracheal Tubes. By N. A. GILLESPIE, B.M.—(*Illustrated*) 548

THE SERVICES

Royal Naval Medical Service.—Royal Army Medical Corps.—Royal Air Force.—Indian Medical Service.—Deaths in the Services 570

PANEL AND CONTRACT PRACTICE

Amendments to the Regulations.—Agreement on Certification 573

OBITUARY

Eric Danvers Macnamara, F.R.C.P. 574

David Duncan Main, F.R.C.P. 574

MEDICAL NEWS

Microchemical Club 575

St. Mary's Hospital 575

National Children's Home and Orphanage 575

St. George's Hospital 575

Fellowship of Medicine and Post-Grad. Med. Assoc... 575

Kirk Duncanson Research Fellowship 575

Instruction in Contraceptive Methods 575

Princess Beatrice Hospital 531

Palmer Memorial Hospital, Jarrow 540

Hertford British Hospital, Paris 562

NOTES, COMMENTS, AND ABSTRACTS

Old Age. By HORACE C. COLMAN, M.D. 576

Agranulocytosis after Antisyphilitic Treatment 577

A New Type of Bandage .. 577

Mova Ampoules of Nitrate of Silver—(*Illustrated*) .. 578

Medical Diary 575

Appointments 575

Births, Marriages, Deaths 575

Vacancies 578

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THE disadvantages of a squint need little emphasis. At school a squinting child is very apt to suffer from his fellows' youthful dislike of the abnormal; his friends call him "boss-eye," and his enemies exercise a somewhat crude sense of humour at his expense.

Hence the psychological implications of a squint are always worth consideration; but the chief object of treating it is neither the psychological nor the cosmetic one, but the prevention of amblyopia in the squinting eye.

The ætiology of concomitant strabismus is still not altogether understood. Hippocrates [1] recognised a distinction between paralytic and concomitant squint. The latter he thought due to epilepsy, or in some cases to heredity. A parent with a cross-eye often had a cross-eyed child. In 1738 we hear of an operative cure for squint by the Chevalier Taylor, a flamboyant but intelligent quack oculist whose adventures were well described by Coats.[2] The details of the operation were surrounded by deliberate mystification; but the evidence appears to point to Taylor having discovered the secret of tenotomy of the internal rectus. It is difficult to decide how far he was scientist and how far charlatan. The secret discovered by this Englishman was forgotten. It is not till the next century, in 1839, that we have the first authenticated tenotomy of the internal rectus on the living subject by Dieffenbach.[3] Anthony White and Stromeyer [4] had both previously suggested the operation.

At this period the muscular theory of squint held the field. It was thought that strabismus was due to shortening of one of the ocular muscles. In fact such shortening is quite frequently found in a case of long-established squint limiting the movements of the eye in one direction. We now know that such changes are secondary, and are not the primary cause of the condition. Most squints are dynamic and will pass off under an anæsthetic.

In 1864 the great Donders [5] pointed out the association of hypermetropia with many cases of squint. Uncorrected hypermetropia requires the exercise of a constant effort of accommodation; and he observed that normally accommodation is associated with convergence. He suggested that this was the cause of squint, the eye of greater refractive error converging more and turning in. This association of accommodation and convergence is well demonstrated in the following cases.

A girl, aged 12, was said to suffer from transient attacks of partial blindness. On examination her vision was found to be about 6/36 in each eye. I noticed that the eyes now and again converged in a spasmodic fashion. With a −1·75 sphere before each eye she saw 6/6 easily. When the refraction was worked out under a cycloplegic she was found to be emmetropic. This spasm of convergence and of accommodation appeared to be of reflex origin; it cleared up after treatment of a conjunctivitis from which she suffered. Some such cases appear to be hysterical. A youth of 18 years had a narrow escape in a car accident and then complained of diminished vision. On examination both eyes were turned in and in a spasm of accommodation. Under a cycloplegic the convergence was at once materially reduced and soon cleared up.

Donders's theory was of enormous practical value, as it led to the careful correction of refractive errors in squint, under which treatment many cases clear up. Obviously, this theory cannot explain such cases of squint as those in which the refractive error is negligible or in which an eye with poor vision starts to squint, as in the squints so commonly found in cases of central corneal nebulæ in one eye. Obviously, also, there must be some other factor involved, or all cases of high hypermetropia would squint. In Donders's writings one finds the germ of an explanation. He wisely remarks: "The desire to see an object singly with both eyes, at the same moment, makes itself, as a general rule, energetically felt." In this country Claud Worth [6] particularly has stressed the important part played by the "fusion sense" in the causation of squint. Binocular vision he classifies in three grades:—

1. Simultaneous macular perception.
2. True fusion with some amplitude.
3. Sense of perspective.

To this grouping one may perhaps be allowed to add a fourth grade or subgroup—"Highly developed sense of perspective." Anybody who works with a stereoscope finds it more difficult to get a sense of perspective with some pairs of pictures than with others. Some patients who can get simple perspective effects on such a stereoscope as the Worth's amblyoscope, for instance, fail entirely to get the perspective effect with more complicated pictures.

If a series of squint cases is examined it will be found that all have defects in binocular vision. Worth considers defect of the fusion sense the primary factor in the production of squint. A case with high astigmatism in one eye only or with a corneal nebula will obviously have defective fusion and so will be more likely to squint.

Defective fusion sense is not the only factor involved. I recently worked out the degree of binocular vision in 12 medical students all of whom had good visual acuity. Only 7 had perfect binocular vision; 3 achieved plane fusion; 2 had only simultaneous macular perception. None of these students squinted. Many people in ordinary life get on quite happily on plane fusion. A car can readily be driven in the country on second grade binocular vision, though stereoscopic vision is of great help in town driving.

The ordinary person has a master eye on which he mainly depends, usually the right eye. The second eye fills in a few details not visible to the master eye. The truth of this is readily apparent if one tries to use the other eye for shooting.

For the development of a squint some other factor is usually necessary besides defective fusion sense. It may be a neuromuscular incoördination—e.g., following measles, pertussis, or other specific fevers. In some cases, the convergence-accommodation coördination is rendered more difficult by hypermetropia, as Donders described. In high myopia there is little accommodation for close work; the eyes fail to converge; diplopia results and the image of the worse eye is suppressed. The fusion sense becomes more defective and the myopic eye tends to diverge, producing a divergent concomitant strabismus.

* A post-graduate lecture delivered at King's College Hospital.

Sometimes the factor predisposing to squint is of such a nature as to suggest some abnormality of genes or chromosomes. Among my strabismus cases are two little girls, identical twins. They are almost indistinguishable now that I have operated on their squints. Features and temperaments are alike; both have rough, dry skins; both have epileptic fits; one is slightly more shy and less round-faced than the other. Their squints were like mirror images; one squinted in the right eye, the other in the left. The refractions were similar, but right and left sides were reversed. Ormond [7] reported a series of mongolian idiots in which 21·4 per cent. had squints. I cannot but suspect that the factors which caused their epicanthic folds, ridged tongues, crooked little fingers, adducted great toes, and mental retardation might possibly be concerned with their squints. In the language of modern genetics, some idiokinetic influence has acted on the chromosomes and their genes; not a very different conception from that of Shakespeare in *King Lear* (Act III., sc. 4):—

"This is the foul fiend Flibbertigibbet: . . . he gives the web and the pin, squints the eye, and makes the hare-lip."

SUPPRESSION OF VISION

Once a squint has set in, the natural result will be diplopia, as indeed is often seen in paralytic strabismus and heterophorias in adults. The child gets over this difficulty by suppressing the vision in the squinting eye, the eye becoming amblyopic—the so-called amblyopia ex anopsia (weak vision from disuse). This term hardly gives a true conception of what occurs. The process is more in the nature of an active inhibition of vision. One is apt to think of suppression of vision solely as a pathological phenomenon in squint. Actually we tend to suppress or suspend the vision of one eye every time we look down a microscope. I had the curiosity to investigate the power of suppression in a number of normal people. They varied from complete inability to suppress to the power to suppress the vision of one eye at will. I have had much experience in helping medical students to use the ophthalmoscope. Most students can acquire the power of suppression in one eye; but there seem always in each group to be one or two men who have the greatest difficulty and very likely have persistently to close the eye which they are not using for the instrument. At the other extreme are people who suppress with extreme readiness—e.g., hysterical monocular blindness. The amblyopia of the hysteric presents considerable resemblance to that found in squint. It does not seem to be of conscious origin; I have often been thanked with what seems complete sincerity by an hysteric whose blindness has been relieved. Hysterical amblyopia, like amblyopia in squint, may be of long duration.

Ten years after the war I saw a man who lost all but perception of light in his right eye during some frontier fighting in India. The story was that he lost his memory for some hours and then found himself some miles behind the front line. His condition was diagnosed as sunstroke, and he found he could not see with the right eye "owing to a blood-vessel bursting behind it." This disability meant that he could not fire a rifle, and he was transferred to a job at the base. The disability persisted into civilian life. Seen in 1928 for refraction he was unable to count fingers with the eye, which presented no objective signs of disease. He was told there was a chance of late recovery after sunstroke, and after a few lessons on the amblyoscope his vision improved to 6/12. This case responded to tests in the same way as an amblyopia from squint, except that there was constriction of the visual field. The cure was due to removal of a strong inhibition to vision in the right eye.

All the evidence goes to show that the amblyopia of squint is due to inhibition of vision, not disuse. I have operated on a child of 12, practically blind from birth from cataract following corneal perforation in ophthalmia neonatorum. The resulting vision, allowing for corneal nebulæ, was good. If simple disuse could cause amblyopia, surely he would have had it.

The cerebral mechanism of suppression is rather interesting. If the inhibition involved one calcarine cortex, inhibition of half the visual field would be expected. Actually the amblyopia involves cone vision in the whole of one eye except for a small piece of temporal field not overlapped by the field of the straight eye. This is an extraordinarily circumscribed area to be selected for inhibition. In hysterics visual inhibition seems closely associated with an emotional factor. The large majority of squinters seem to be of averagely placid temperament. Whatever the mechanism of suppression, it is a process capable in certain cases of rapid removal.

ALTERNATING CONCOMITANT STRABISMUS

Like migraine, alternating concomitant strabismus is a disease of the mentally intelligent. The patients are active and alert, keenly interested in their surroundings, and are up to all sorts of dodges, such as learning by heart the Snellen's test types and the amblyoscope pictures. At will the patient can see with either eye, while he squints and suppresses with the other. The milder cases blink their eyes in a typical way when changing from one eye to the other. Worth distinguishes between the essential alternators with no binocular vision and the facultative alternators who usually prefer to use one eye but can in emergency use either. Alternators often show signs of incoördination between the two sides of the body. A smile will often start on one side of such a child's face followed at a fractional interval by the spread of the smile to the other side. The rare instances where squint may have an emotional basis are to be found in alternating squinters. One little girl voluntarily straightened her eyes up on the operating table and tearfully promised she would always keep them straight in future. She now alternates (according to her mother) when by herself at home, but straightens up when she meets the formidable bogy of the surgeon at hospital. Of course these dynamic squints may later become organic from actual secondary shortening of the internal recti.

FALSE PROJECTION

If the good eye in a case of squint of long standing is covered and the patient asked to point out the direction of objects, he will make a much better job of it than the observer would expect from the degree of squint. It seems that the brain has realised that the eye is not straight and is making allowances. If the eye is put straight this false projection usually ceases, but not always—as shown by the following case.

A lady, aged 24 years, had since childhood a right convergent concomitant squint of 55 degrees (40 degrees with glasses). Although the right eye usually squinted she could with an effort alternate the squinting eye. An operation was performed which left the eye straight with glasses. In a recent letter from Australia she wrote: "As regards straightness I am glad to be able to say my eye seems to be keeping quite alright. I find myself using the left eye a great deal more than the right. It appears to me that, although my eye itself is straight, the

angle at which it had been accustomed to looking when it was squinting is hard to change. If I make an effort to use my right eye when it is straight it seems to be looking to the outer side. Ought I to persevere till I can use the right eye as well as the left?"

In what part of the brain do these complex cerebral readjustments take place? Direct evidence is scanty. Holmes and Horrax in 1919 [8] reported a case showing, among other signs, loss of stereoscopic vision following a gunshot wound which seemed, by craniometry and other tests, to involve both angular gyri. Riddoch in 1917 [9] reported a case where stereoscopic vision was lost after a bullet wound which "may or may not have injured the left optic radiation fibres, but certainly passed through those of the right hemisphere." In both cases the lesions were crude and severe.

We may, perhaps, by analogy gain some insight into the nature of suppression by considering the conceptions of Pavlov [10] concerning inhibition. He applies the technical term of "analyser" to the entire mechanism of those parts of the central and peripheral nervous system which are related to each particular receptor organ—e.g., retina, optic nerve, tracts, radiations, and cortex. Inhibition is "local sleep," and the seat of inhibition is within the inhibited analyser and not within the inhibiting one. Little is known of the anatomical localisation of such "local sleep" as the suppression of vision in a squinting eye. Ordinary sleep is a process of widespread inhibition of cortical and subcortical centres. Righetti [11] working on tumours and von Economo [12] on encephalitis have shown that in states of pathological sleep lesions are found in a high percentage of cases in relation to the third ventricle. This association must be of significance.

TREATMENT OF SQUINT

In the treatment of this condition we should have in mind from the start the results for which we are aiming. In a cured case we should find:—

1. The eyes straight.
2. Good visual acuity in each eye when refractive errors are corrected.
3. Full binocular vision.

When a case is seen for the first time the physician should:—

(*a*) Take a careful history, including a family history of any squint. A knowledge of the social conditions of the family is of importance. Attendance twice a week for orthoptic treatment should not be ordered if it means a struggling parent losing two half-days' work to bring the child.

(*b*) The visual acuity is accurately measured if possible. Children too young to read letters can use one of the test-type boards with animal pictures of graded sizes. During this procedure the surgeon gains the child's confidence and does his best to break down the rooted idea that a doctor is a bogyman who prises one's mouth open and jams a spoon down one's throat. If vision is poor the squinting eye is tested for central fixation.

(*c*) By this time the child will usually consent to look down one of the varieties of amblyoscope. A graded series of pictures will soon settle the degree of binocular vision present, if any.

(*d*) Accurate measurement is made of the degree of squint. The Maddox tangent scale and the Priestley Smith measuring tape are both good for purposes of measurement. Allowance should be made for the angle "gamma," or the angle between the optic axis—or line on which the refracting surfaces of the eye should be centred—and the fixation axis. The latter is a line drawn from the object viewed to the hypothetical centre of rotation of the eye. This conception has recently been disproved by van der Hoeve.[13] In practice the angle "kappa" between the central pupillary line and visual axis is more conveniently measured by clinical methods.

(*e*) The refraction of the eyes should next be measured under full atropine cycloplegia. Glasses are ordered of such a strength as to give the maximum visual acuity when the atropine has worn off. In all except the most stupid children it is a mistake to over-correct the hypermetropia in the hope of reducing accommodation and convergence for near objects. The patients soon find they can see better without the glasses, and look round them or take them off. Worth, in a series of cases, actually found the deviation was greater when they were over-corrected.

(*f*) After the glasses have been worn for a month the patients should be re-examined, the squint, if present, accurately remeasured, and the visual acuity in each eye re-determined. In about 33 per cent. of cases the eyes will be straight. If the squint recurs when the glasses are removed, or if the visual acuity is lowered in the squinting eye as compared with the sound eye, further measures are advisable.

(*g*) If the squint is under 10 degrees in amplitude and the vision in the worse eye is 6/12 or better, fusion training may be tried. It is no good before operation if the squint is of the alternating type. The idea is to train the fusion sense on one or more of the specially adapted stereoscopes known as amblyoscopes. Various firms of opticians have of recent years produced many types of giant amblyoscope specially adapted for use in large-scale orthoptic clinics. They are more imposing-looking machines and will stand heavier wear than their progenitor, the Worth amblyoscope, but the latter will produce equally good results. The patient is exercised once or twice a week, or more often if possible, on graded series of pictures so arranged as to require an increasing degree of binocular vision. Satisfactory perspective pictures must all be capable of being reversed. It is no use making the patient say which of two objects is the nearer if it is perfectly obvious from the shading of the picture. Children often have good memories and will remember from the previous visit which object is in front unless they can all be reversed at will. The Griffith set of amblyoscope pictures fulfils all these difficult conditions.

If one picture in the amblyoscope is imperfectly seen it can be brought to the child's attention by increasing the illumination on that side—e.g., by an electric torch. The child should be encouraged to persevere with what seems like a hard school task, if necessary by bribery, as by drawing pictures for him.

It is interesting to watch how the binocular vision improves. A child may stop at the same grade for several visits, then there is a sudden jump of one or two grades. To my mind this is a strong argument in favour of the idea that the low-grade binocular vision is due to active inhibition of the vision of the squinting eye. Amblyopia is not really from disuse. Hysterical amblyopias also improve on the amblyoscope by sudden leaps from one grade to a higher.

If full-grade binocular vision can be obtained, the squinting eye will come straight at once. It must never be assumed that a patient has really regained stereoscopic vision unless a whole series of pictures is correctly interpreted in succession. One or two pictures may be correctly guessed by any child. Many published results are vitiated by lack of care in avoiding this error. I have often listened to

enthusiasts unwittingly suggesting to their patients the replies they ought to give.

When the patient has acquired binocular vision this must be nurtured like a delicate plant. I have seen many cases—believed to be cured or improved—relapse after an untreated interval or an attack of some minor malady. Instruments such as the Maddox "cheiroscope" and the Whittington stereoscope use the principle of coördinating hand and eye and are often of value.

Orthoptic treatment, therefore, is difficult and uncertain. It is no good unless the patient can attend at short intervals over a long period; it is little use in squints of large amplitude or in the presence of amblyopia of any degree. Many cases expected to be favourable do not respond, or relapse. There is, however, some scope for the treatment, which is especially useful when used intensively after a squint has been almost straightened by operation.

OCCLUSION OF THE GOOD EYE

(h) If, after the trial month, the squinting eye shows a squint or some amblyopia this is worth trying. It was originally suggested by the naturalist, Buffon, about 1743.[14] In small children, the good eye may be kept shut by a pad and adhesive plaster, as recommended by Worth. In older children, the best way is to get the mother to sew a black patch over the glass before the non-squinting eye. The patch should cover the chink near the nose and should be extended along the limb of the glasses on that side, otherwise the child tends to look round it. There are many manufactured occluders on the market, perhaps the best being Doyne's. In my experience the mother is rather apt to assume that a bought occluder must necessarily be efficient. On the contrary, she is constantly watching to see if the child is looking round the home-made one, and it therefore gives better results.

Occlusion, to be effective, must be continuous. It should be continued until the vision is improved to its maximum possible degree. This may take several months. Over the age of eight years the chances of improvement from occlusion are reduced, but are not so remote as the text-books suggest. I have seen a boy of 16 improve from amblyopia to 6/12 after occlusion.

A similar method, particularly useful in infants, is the instillation of atropine drops into the good eye. In babies the squinting eye quickly acquires amblyopia if left alone, but if the other eye is atropinised the squinting eye is forced into use for close vision.

Glasses can be worn with benefit by infants of nine months and over, but atropine can be used in the good eye whenever a squint is noticed. Delay may cause amblyopia and a squint, irremediable except by operation.

SURGICAL MEASURES

(i) If all the methods previously mentioned have been given adequate trial and have failed, as they often do fail, then operation should be performed, provided the child is in good health and free from septic foci. Under modern conditions and with modern needles and instruments, operations for squint can be undertaken at any age over three years with the fair certainty of obtaining at any rate a good cosmetic result. The reluctance shown by some surgeons to operate before puberty is a relic of the reaction which set in against the indiscriminate tenotomies of the end of last century. These tenotomies were uncontrolled surgical procedures and, as Worth recalls, were often followed by secondary divergence of the eye in the opposite direction. In modern squint operations, muscles are advanced or retired over measured distances and fixed by suture to the sclera. It is more and more realised that the sclera, though under a millimetre thick, is so tough that it affords firm hold for sutures if the needles used are sharp and inserted tangentially.

In a concomitant convergent strabismus of small degree it is good practice to advance the external rectus muscle on that side. For squints of larger amplitude retirement of the insertion of the internal rectus is effective. The insertion of the muscle should not be put back behind the equator of the eye, or the muscle will act at serious mechanical disadvantage and there may be danger of a late divergence. The exact distance to which the new insertion is displaced is regulated by experience; there is no rule-of-thumb method of calculation. Details of technique vary extensively.

A successful operation from the cosmetic point of view should not mean the end of treatment. If the eyes are straight, measures such as occlusion of the good eye for amblyopia, and fusion sense training, are much more likely to succeed. The criteria of a cure must not be forgotten: straight eyes, good sight in each, full binocular vision. Once the first factor is achieved the others are more likely to follow. Not long ago I tested the binocular vision of three cases of squint operated on two years before. Owing to circumstances, no training of the fusion sense had been tried before or after operation. They had all acquired full binocular vision by the unaided exercise of their own eyes. I thought wistfully of how well they would have looked in my somewhat meagre statistics of successes under orthoptic treatment.

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DISTURBANCES OF THE BODY TEMPERATURE*

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We have already seen that the various processes which are concerned in the genesis and dissipation of heat are under nervous control, but there is great diversity of opinion as to whether special centres for the regulation of the body heat exist in the brain.

Heat-regulating Centres in the Brain

Sir William Hale-White, to whom I am deeply indebted in the preparation of these lectures, by experimental observations upon animals and by clinical investigation was led to the conclusion that one or more special centres for controlling the

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mechanism of heat regulation existed. He showed that injury to the brain of an animal in the neighbourhood of the corpus striatum was followed by disturbances of the body temperature most often in the direction of an increase. Further indication that the heat-regulating centre was situated in the neighbourhood of the basal ganglia was suggested by experiments in which the brain was destroyed in front of and behind this region respectively. Destruction behind this part of the brain is followed by an entire upset in the heat-regulating mechanism; whereas in front of the basal ganglia the cerebrum of a dog can be removed without any marked change in temperature regulation. In such a case normal temperature regulation is preserved but is limited in range. The animal responds appropriately to external heat and cold, though its temperature falls if it be left for a long time in a cold room.

Some years ago H. G. Barbour carried out a series of interesting experiments in which heat and cold were applied locally to the corpus striatum. When a tube containing hot water was introduced into the corpus striatum the blood-vessels of the skin dilated, there was increased secretion of sweat, and the rectal temperature fell. When cold was applied muscular metabolism was increased and contraction of the vessels of the skin ensued with the result that the body temperature rose. In eliciting these reactions water had to be employed several degrees above and below that of the body temperature. If the corpus striatum was really a delicate thermostat as has been suggested one would have expected that it would have been extremely sensitive to minute differences of temperature.

Since this time further attempts have been made to localise more accurately the site of the heat-controlling centre, and recent investigations suggest that it is situated in the hypothalamic region and most probably in the tuber cinereum. Careful removal of the corpus striatum has produced no loss of temperature regulation (Samson Wright: "Applied Physiology," 1931, p. 87). Puncture of the tuber cinereum has given rise to a sudden increase in the respiratory rate and often extreme pyrexia—occasionally 109° F.—has been recorded. In many instances glycosuria has occurred, polyuria setting in very regularly within one to three days from the time the puncture was performed. From the fact that Barbour had to employ water several degrees above or below that of the body, it has been argued that the site concerned with heat regulation must be situated some distance away from the corpus striatum where the tubes were applied and in the light of what has just been said this site might well be the tuber cinereum. I doubt in the present state of our knowledge if more can be said. Cramer, whose views on the causation of pyrexia we shall notice more fully presently, regards heat regulation as a function of the sympathetic nervous system controlled by the thyroid-adrenal apparatus, and points out that the so-called heat centre in the tuber cinereum is explicable as a group of nerve-cells representing the central connexions of the sympathetic system.

PYREXIA ASSOCIATED WITH CEREBRAL HÆMORRHAGE OR TUMOURS

It has long been known that hæmorrhage into the pons, or cerebral softening in this position, is usually accompanied by pyrexia. It was Hale-White who furthermore drew attention to the fact that damage to the motor cortex of the brain is likely to be attended by a rise of temperature. He pointed out that in cases of hæmorrhage from the middle meningeal artery, blood clot may press upon the cortex and cause pyrexia which in some instances may reach 109° F. He says:

> "There is hardly any part of the brain a lesion of which has not at some time or another caused a rise of temperature. Seeing, however, that disease of the cord, of the pons, of one crus, of the basal ganglia and of the motor area of the cortex will all cause pyrexia, it is highly probable that in man the course of at least some of the nervous impulses which control the temperature is the same as, or much the same as that of motor impulses. It is true that disease of other parts of the brain will cause pyrexia—thus we have known hyperpyrexia to be due to a cerebellar tumour but . . . parts far removed from the lesion may be exposed to pressure or suffer from interference with their blood-supply. In the case of the cerebellar tumour just mentioned in which the temperature reached 107·4° F. the corpora quadrigemina and surrounding parts were much compressed by the tumour."

The pyrexia consequent upon aseptic damage to the brain both in man and in experiments on animals is usually short in duration and difficult to control, prolonged immersion in cold water being necessary to effect a reduction. A study of the temperature chart in a case of apoplexy is of interest. In an ordinary case of cerebral hæmorrhage where rupture of one of the branches of the middle cerebral artery which pass through the anterior perforated space occurs there is an initial fall of temperature lasting a few hours and attributable to shock, the temperature then rises 2–3° above the normal, the highest point being generally reached in 24 hours. In a case that is going to terminate favourably the temperature then slowly falls, the normal line being reached within a few days. This is usually followed for two or three days by a subnormal reading and then the normal standard is again reached. Not every hæmorrhage in this situation is attended by pyrexia; in some instances the damage is too slight, in others the hæmorrhage is so profuse and the shock so profound that no pyrexial response supervenes. If the temperature be taken in the axilla of the paralysed side in an ordinary case of cerebral hæmorrhage it is likely to be higher than in the axilla of the unaffected side and may remain so for several days, the difference gradually becoming less. At first the difference may be as much as 1° F. Hale-White attempted to discover the cause of this by recording the surface temperature, estimating at the same time the amount of sweat secreted on each arm. He says:

> "It is clear that the arm with the higher surface-temperature or secreting the greater amount of sweat will be losing heat the faster of the two arms. By this method it was found that the loss of heat was greater from the arm of the paralysed side, that is to say, the side on which the axillary temperature was higher. But the axillary temperature is an internal temperature, and the loss of heat is therefore greater on the side on which the internal temperature is higher. This being so more heat must be produced in paralysed than in the healthy muscles. These observations if confirmed suggest that as the muscles are the chief thermogenetic tissues, a lesion which paralyses their motor function exalts their thermogenetic activity" (Allbutt and Rolleston: "A System of Medicine," 1905, vol. i., p. 849).

The statement that more heat must be produced in paralysed than in healthy muscles appears to be at variance with the conception that metabolic activity is the source of heat production. An explanation more consonant with the principle of metabolic activity would, I think, be more convincing, and I think it is to be found.

In a paralysed limb the arterioles at first are dilated on account of loss of vasomotor tone and the early rise

of temperature on the paralysed side is to be attributed to the greater amount of blood flowing through the dilated arterioles. Tone in smooth muscle is not so completely dependent on reflex nervous impulses as is the case in voluntary muscle. A certain power of adaptation which is independent of the nervous system appears to be present and asserts itself after a few days (compare the case of a paralysed bladder). In consequence of this less blood circulates through the paralysed limb and, owing to the paralysis of the skeletal muscles, the venous return is impaired. Blood tends to stagnate and, in consequence, the temperature falls till eventually the paralysed limb becomes colder than the unaffected one.

In cases in which the pons or medulla are damaged either a rise or fall of body temperature may ensue. It is usually said that a pontine hæmorrhage causes hyperpyrexia. This, however, is not always so. The greater part of the body is not only paralysed but is cut off from the control of the heat-regulating mechanism. The patient is comparable therefore to a poikilothermic or cold-blooded animal, the temperature following passively the temperature of the environment. Where the person is well covered and surrounded by hot-water bottles the temperature of the paralysed parts of the body will rise. If the paralysed parts are cooled the general temperature will fall. In hospital the former conditions usually prevail and a high temperature therefore is more commonly to be observed. No sensory impulses can pass from the paralysed parts to the brain, nor can efferent impulses reach the affected muscles or the blood-vessels.

Tumours arising in the neighbourhood of the third ventricle by causing downward pressure upon the tuber cinereum and the pituitary body may give rise to irregular pyrexia accompanied by somnolence, polyuria, hyperglycæmia, and glycosuria. In such cases the sufferer may furthermore grow obese and show sexual regression. Neoplastic metastases in this situation may give rise to progressive cranial nerve palsies, drowsiness, cervical rigidity, and pyrexia producing a clinical picture not easy to distinguish from tuberculous meningitis. In a case of paraplegia resulting from a complete transverse lesion of the spinal cord, the man when he feels cold shivers only with the muscles supplied by nerves above the lesion; on the other hand, when he is hot he sweats only down to the line between the sensitive and insensitive portions of his skin. Such observations are of use in investigating the position and severity of a spinal lesion.

Part Played by the Ductless Glands

No one interested in the subject of regulation of the body temperature can afford to neglect the views put forward so succinctly by W. Cramer in the book entitled "Fever, Heat Regulation, Climate, and the Thyroid-Adrenal Apparatus," published in 1928. I do not think I can do better than to state in his own words the conclusions he reaches.

"With the exception of respiration, all the factors concerned in the heat regulation of warm-blooded animals are under the direct control of the sympathetic nervous system, and therefore subject to control by the functional activity of the thyroid and adrenal glands. Increased functional activity of these glands has the effect of stimulating the sympathetic. There is therefore both a nervous and a humoral apparatus for heat regulation. Stimulation of the sympathetic increases metabolism and thereby increases heat production. While it diminishes heat loss through constriction of the cutaneous blood-vessels, it increases heat loss through the stimulation of the sweat glands. This latter effect may be inhibited by the constriction of the cutaneous blood-vessels. In furry animals which cannot regulate heat loss by sweating this function is taken over by the arrectores pilorum: in these animals sympathetic stimulation increases heat loss through stimulation of the arrectores pilorum. This mechanism is, however, less efficient than that of the sweat glands.

"It follows, therefore, that stimulation of the sympathetic by increasing heat production and by preventing a compensating increase in the heat loss or actually diminishing it produces a type of fever: 'sympathetic fever.' Such a fever can be induced by increased functional activity of the thyroid and adrenal glands, even without the presence of bacteria. Evidence is adduced that in many of the fevers due to bacterial infections there is an increased functional activity of these glands. In fever there is a change in body temperature, or as it may be called, the 'internal thermal environment' due to the stimulation of the thyroid and adrenal glands.

"Conversely, the functional activity of these glands can be brought into play by changing the 'external thermal environment.' Exposure to cold, which calls for increased heat production and diminished heat loss, stimulates these glands to increased activity. Exposure to heat diminishes their activity. The thyroid and adrenal glands represent therefore a humoral apparatus for the heat regulation of the body. This accounts for the physiological and psychological effects of climate. A bracing climate is one which stimulates the sympathetic and the thyroid and adrenal glands, a 'relaxing' climate one which fails to stimulate them. The work of Leonard Hill and Argyll Campbell has shown that one of the effects of a bracing climatic environment, such as open air treatment for instance, is a rise in metabolism. But a rise in metabolism in itself does not account for the beneficial effects of such an environment. The explanation is to be found in the increased functional activity of the thyroid-adrenal apparatus of which the rise in metabolism is one manifestation."

He continues: "The conception of heat regulation as a function of the sympathetic which emerges from these conclusions, enables us to dispense with the idea of a heat centre or of several centres, which are supposed to function like a thermostat and which in fever are supposed to be 'set' at a higher temperature. It is curious that such a crudely vitalistic conception, which really explains nothing, should have dominated physiological and pathological thought for such a long time. Since heat regulation is a function of the sympathetic the so-called heat centre in the tuber cinereum is explicable as a group of nerve-cells representing the central connexions of the sympathetic."

We shall be in a better position to comment on the views put forward above after we have considered in further detail the question of fever.

The Meaning of Fever

In the preceding lecture fever was defined as a complex response of the body to infection in which pyrexia or raised temperature was but one of the manifestations. It is essentially a response in metabolism associated with a toxic disturbance of heat regulation. In fever the nervous control of temperature is altered but it does not appear to be thrown out of action entirely; it is merely disordered. The febrile patient still responds to heat and cold, but he is affected more easily than in health as though the nervous control were more labile. The diurnal variations in temperature still occur, though they may be altered in their range or even reversed, as in the so-called inverse temperature sometimes seen in cases of pulmonary tuberculosis. It is a case of altered regulation. Carl von Liebermeister, who was the first pathologist to investigate fever calorimetrically, enunciated the doctrine that in fever the temperature is adjusted to a new norma. Some

distinguished pathologists still adhere to this view. They believe that in fever the body adjusts its temperature to a higher level than normal—as though tuned to a higher key—just as the regulator of a thermostat may be moved up a few degrees in order to keep an incubator at a higher temperature. That is to say, the balance between heat production and heat loss is adjusted at a higher level. For example, during muscular exercise heat production may be increased from 200 to 300 per cent., whereas in fever it is only increased from 20 to 30 per cent. Yet in the former the temperature remains normal, while in the latter it is raised (Boyd). Again, in exophthalmic goitre the heat production may be 80 per cent. above normal, yet the temperature of the body is rarely raised for the skin is flushed and moist.

The earlier investigators held opposing views as to the origin of fever. Liebermeister taught that the increased temperature was due to an increased production of heat. Ludwig Traube, on the other hand, held that it was due to deficient loss of heat. Hale-White in his Croonian lectures in 1897 brought forward evidence to show that pyrexia is not to be ascribed in all cases to one common underlying process, it being due in some instances to the one, and in some to the other. He says:—

"It appears to me to be possible that the discussion has in a sense been beside the mark, for we know that most, if not all, fevers are due to the circulation of poisons in the blood, and there is no reason why we should believe that they all produce pyrexia in the same way. All collateral evidence is against such a view; many poisons accelerate the beat of the heart, but some act upon the vagus, others upon the accelerator nerves; many poisons produce diaphoresis, but jaborandi acts upon the peripheral terminations of the sudoriparous nerves while opium acts centrally. And I hope I shall, in these lectures, be able to bring forward evidence to show that sometimes pyrexia is due to an increased production of heat and sometimes to a diminution of the loss. If this can be done it will put an end to the discussion as to whether in fever the production of heat is increased or the loss diminished; but we shall have to discuss the question for each separate febrile disease" (THE LANCET, 1897, i., 1660).

We now know that even in the same fever one or other of these processes may predominate at different stages of the disease.

CHEMISTRY OF THE FEBRILE STATE

It is very difficult in our present state of knowledge to explain the manner in which invasion of the body by pathogenic organisms leads to the complex response we speak of as fever. It is suggested on the one hand that the toxins produced by the invaders directly affect the heat centre; on the other hand, it may well be that certain substances liberated from the damaged cells of the host are responsible. It has long been recognised that excessive katabolism of proteins is one of the most striking features of the febrile state. When considering the subject of hyperthermia we referred to the fact that the mere existence of pyrexia led to a further increase of metabolism and saw that a vicious circle might thus be set up. The chemical reactions of the body, like those occurring in a test-tube, are speeded up by a rise of temperature. It has been calculated that a patient with a temperature of 105° F. would manifest an increase of 50 per cent. in his metabolism and in his pulmonary ventilation because of the pyrexia alone. The enormous destruction of protein that occurs is shown not only by the increased output of urea, creatinine, and purine bodies in the urine, but also by the wasting and loss of weight that occurs in any prolonged fever. The output of phosphorus and sulphur is also increased for the same reason. The urea may be increased two- or three-fold in the urine. In typhoid fever this increased output of nitrogenous bodies may represent a loss of four or five pounds of muscle in a week.

Loss of weight, however, is not solely to be attributed to destruction of the proteins of the body. Doubtless loss of appetite and diminished intake of food play their part. In this connexion it is interesting to note that free hydrochloric acid is usually absent from the gastric juice if a fractional test-meal is carried out. The glycogen in the liver and muscles rapidly become exhausted. Fats are also destroyed though in lesser degree than proteins, and in the presence of a comparative poverty of carbohydrate some degree of acidosis is often met with. Acetone is frequently to be found in the urine. The rapid respiration characteristic of fever serves to reduce acidosis by eliminating more carbon dioxide through the lungs. The presence of acetone bodies in the urine of febrile patients does not exclude the existence of an alkalosis. Alkalosis is most likely to be met with in pyrexia associated with pulmonary lesions in which the oxygenation of the blood is effected with difficulty and in which hyperpnœa results.

Koehler has recently demonstrated (1923) that an alkalosis may be present in influenza. A slight alteration in the pH of the blood towards the alkaline side is found and is accompanied by a fall in the plasma bicarbonate. The occasional occurrence of tetany in connexion with the acute fevers lends support to Koehler's views. In a paper by Leach, Vickers, and Brown on the reaction of the blood in experimental pneumonia (1924), findings are given which suggest that, while an alkalosis due to increased pulmonary ventilation may occur in the early stages of the disease an acidosis subsequently develops. The development of the acidosis appears to be associated with an increased concentration of the acetone bodies in the blood, and the change in the pH of the blood towards the acid side and the higher grades of bicarbonate reduction, which are found in the terminal stages of the condition, appear to result from a ketosis (O. L. V. de Wesselow).

At the onset of fever and during the stage of rigor there is often increased diuresis due to the increased blood pressure, and copious diuresis often occurs as the temperature falls at the end of a febrile attack. During the height of a fever urine is diminished in amount, becoming concentrated and highly coloured. Urobilin may be present in considerable quantity, apparently resulting from increased destruction of hæmoglobin and in consequence some degree of anæmia is the rule. The urinary chlorides are diminished in all fevers excepting malaria, and the reason for their retention is not understood. It is quite different from the chloride retention of nephritis, for in nephritis the blood chlorides are high, whereas in fever they are low. They must therefore be retained in the tissues. Water retention also occurs; possibly this is to be correlated with the retention of chlorides in the body and the diminished excretion of urine. The diminution of the urinary chlorides is exemplified particularly in the case of pneumonia.

It is usually stated that in this instance they are retained in the inflammatory exudate in the lungs, yet in some cases where a crisis occurs without simultaneous resolution of the lung they make their appearance again in large quantities at and immediately following the crisis. Since the body requires a certain amount of sodium chloride for its metabolic processes and seeing that these are greatly increased during fever, it may be that they are being

retained, especially if their intake in the food is deficient. Sollman, who investigated this question more than 30 years ago, concluded that the disappearance of the chlorides from the urine during fever is due entirely to the deficiency of the intake of salt in the food. He recommended that ½ oz. of salt a day should be added to the milk given to a fever patient.

OTHER RESPONSES

In some fevers the skin is dry and burning to the touch, the sweat glands being apparently paralysed by toxins. Pneumonia and scarlet fever are obvious instances. The sweating met with in acute rheumatism and acute pulmonary tuberculosis proves a notable exception to the general rule. The rate of the heart is increased and at the onset of a febrile illness when the arterioles of the skin are contracted the blood pressure is usually raised; later, when the blood-vessels dilate and the heart is beating less powerfully, the blood pressure falls and the pulse becomes dicrotic, a phenomenon which is particularly well seen in cases of typhoid fever. We have seen that the respirations are increased in rate and there is an increase of CO_2 in the expired air on account of the great increase in metabolism which is occurring. The disturbance of the nervous system is shown by restlessness, depression, and, in more severe cases, by delirium, tremor, and subsultus tendinum.

It may be said that we are still in the dark as regards many of the phenomena occurring in the febrile state, that is, how far they are to be attributed to the state of pyrexia or how far they are the direct result of toxæmia. For instance, albuminuria is in some instances probably the direct result of the pyrexia, but it is so much more frequent in diphtheria and scarlet fever than in other febrile conditions that in these instances it is almost certainly due to specific toxins. In the same way, leucocytosis, though so often associated with pyrexia, can scarcely be attributed to the febrile state, for it is absent in the enteric group of fevers, malaria, influenza, measles, German measles, and tuberculosis. Constipation is of frequent occurrence in the febrile state, and if Cramer's views are accepted this could be explained by the inhibition of intestinal movements from sympathetic stimulation. The same observer also attempts to account for the terminal bronchopneumonia met with so frequently in the infectious fevers. The pulmonary œdema and congestion which arise as the result of prolonged sympathetic stimulation provide a ready soil in the lung for the localised growth of invading organisms.

Other Theories of Fever

So far we have assumed fever to be the result either of the direct action of toxins produced by invading organisms on the nerve-cells in the tuber cinereum, or else on the tissue cells of the body, from which some hypothetical substance is set free which in turn upsets heat regulation. There are, however, other theories of fever which must be more or less briefly noticed. One of these is usually referred to as the water-shift theory of fever. It postulates that as a result of infection there is a shift of water from the blood to the tissues so that the blood becomes concentrated.

As a result of the reduction in blood volume blood is no longer avilable for the skin vessels and the resulting vasoconstriction by diminishing heat loss brings about pyrexia. Much stress is placed on the increased concentration of the blood. It is known that conditions which lead to concentration of the blood such as hypertonic saline concentrated sugar solutions, and certain purgatives may bring about fever and probably do so by increasing the difficulty of perspiring, but in fever the concentration where it exists has not been shown to be the primary cause and may well be a secondary result. What exactly happens to the sodium chloride which leaves the blood has yet to be elucidated, and it has yet to be shown that it takes water with it. Until we know this the water-shift hypothesis appears very uncertain (R. J. S. McDowall).

Another theory of fever is that of lack of free water. There is reason to believe that the greater part of the water in the blood and tissues is bound by the colloids and possibly to some extent by the crystalloids and that blood and protoplasm may be looked upon as hydrates. It is only the free water that can be readily excreted in urine and sweat and which migrates readily from vessels to tissue spaces and back again as need arises. Such an hypothesis serves to explain fever as a lack of free water impairing the temperature regulation capacity of the body (Balcar, Sansum, and Woodyatt, 1919).

A more fascinating theory is that put forward by Cramer and it is necessary to review this in greater detail. According to this observer, as we have already seen, the adrenal medulla, the thyroid, and the sympathetic nervous system constitute the heat-regulating system of the body. His theory rests materially upon the demonstration of extreme secretory activity in the adrenal medulla in fever following the experimental injection of β-tetrahydronaphthylamine or exposure of an animal to cold. In the case of an animal which has been subjected to either of these procedures the adrenal is removed and thin slices are subjected to the action of osmic acid vapour. By this method the specific secretory granules of adrenaline in the medullary cells are rendered visible and their behaviour under various conditions can be studied.

Adrenaline is an easily oxidised substance and reduces readily osmic acid to the black lower oxides or possibly even to the metal itself. If a section of a normal gland which has been treated in this way is examined the cortical cells of the adrenal are seen to be filled with black globules of lipoids and the medullary cells with much finer black granules of adrenaline. It is possible to distinguish between these two groups of substances by immersing the section in crude turpentine, since the turpentine acts as a solvent upon the lipoid material without affecting the adrenaline granules.

In experimentally produced pyrexia Cramer has demonstrated the almost explosive discharge of adrenaline, the granules which have left the cells of the adrenal medulla appearing in the capillaries which separate the alveoli of the gland. When in induced pyrexia animals are killed at a later stage the cells are found to be completely denuded. Signs of similar activity can be demonstrated in the thyroid. The gland becomes intensely congested, numerous capillaries open up between adjacent alveloi and between the lining cells and the wall of the alveolus, the amount of colloid decreases and loses its affinity for hæmoglobin. The lining cells become columnar and the mitochondria become more distinct. On exposure to an external temperature of 37° C. the gland passes into a resting condition similar to that which is observed after thyroid feeding; the alveoli become distended with deeply staining colloid and the mitochondria become indistinct.

Further evidence in favour of Cramer's theory of fever may be mentioned.

Similar changes to those occurring in experimental fever have been found in certain varieties of fever in man. In certain rare cases of pyrexia of unknown

origin the only lesion found on post-mortem examination has been hæmorrhage into the suprarenal gland, and I hope to make further reference to this condition at a later stage. Heat regulation is impaired but not destroyed when the thyro-adrenal apparatus is eliminated by disease as in myxœdema and Addison's disease. It is found that injection of β-tetrahydronaphthylamine into a thyroidectomised animal induces a pyrexia of lesser degree than occurs in a normal control. Experimental hyperthyroidism and experimental hyperadrenalism produce two different types of fever; the one elicits a hectic type, the second a rapid hyperpyrexia.

I will bring this subject to a close by quoting a paragraph from Hadfield and Garrod's "Recent Advances in Pathology" (1932).

"The significance of these results is questioned by Stewart and Rogoff (1922) on the ground that hyperpyrexia can be induced by means of morphine in cats when adrenal secretion has been totally inhibited by removing one adrenal and cauterising the medulla and severing the nerves of the other; this in spite of the fact that with intact adrenals this hyperpyrexia is accompanied by an increased adrenalin output and a diminution in chromaffin content in the medulla."

Is Fever Beneficial or Not?

The question whether fever is beneficial or not can hardly be answered satisfactorily in the present state of knowledge. We have only to recall the seriousness of those infections in old and enfeebled subjects when unattended by any appreciable rise of temperature to assert that its absence is to be feared. It would appear then that the body is able to deal more effectively with the invading organism when the temperature is raised, and to this extent pyrexia is to be regarded as a defensive mechanism. A very high temperature, 107° or 108° F., is certainly harmful and, if continued, will result in death from injury to the nerve-cells. But there is no ground for believing that a moderate degree of fever is detrimental, and it is not necessary to attack it with antipyretic drugs. The bounding pulse of fever is evidence of the increased energy of the circulation and it is largely by the blood stream that protective substances are carried to every part of the body. In the case of infected animals it has been shown that agglutinins and bacteriolysins are produced more quickly and in larger quantities if the animals are kept at a moderate elevation of temperature than in control animals kept at ordinary temperatures, but, as R. T. Hewlett points out, very high temperatures inhibit these immune reactions. It is well known that high temperatures inhibit the growth of bacteria, but it is only in severe fevers that body temperature could have any definite influence in this direction, and such an argument is unconvincing. Temperatures high enough to produce such effects would induce cloudy swelling of the parenchymatous cells of the body.

PRINCESS BEATRICE HOSPITAL.—This institution (formerly the Kensington, Fulham, and Chelsea General Hospital) is in serious financial difficulties. The Marquess of Carisbrooke, the president, has addressed a circular letter to subscribers and donors in which he says that its financial position is precarious, and that the board has decided that it will have to be closed down altogether unless in the near future a considerable sum is obtained. The hospital, which serves a district with 400,000 inhabitants, last year dealt with 1646 in-patients and 4547 street accidents and casualties. There is a debt of £8000 on maintenance account and £68.000 on building and equipment account.

FURTHER OBSERVATIONS ON FILARIAL PERIODICITY

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With a Laboratory Report by

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SINCE the publication of our last paper, entitled Some Recent Observations on Filarial Periodicity,[1] we have had the opportunity of studying another case of *Filaria bancrofti* infection with a heavy infection of filarial embryos in the blood.

The patient was an Indian lascar, aged 26, from Calcutta, who sought admission to the Royal Albert Dock Hospital on account of rheumatic pains in his legs and abdomen (March 10th, 1933). On examination no outstanding clinical signs of filariasis could be found with the exception of enlarged femoral and inguinal lymphatic glands. On X ray examination small shadows were present at the left pelvic brim and also at the level of the twelfth rib—appearances which might be interpreted as calcified filariæ; meanwhile a uroselectan investigation of the renal tract showed nothing abnormal, the small shadows being present in the same situation as in the plain radiogram. As regards laboratory examinations, the night blood contained numerous embryos of *Filaria bancrofti*. The Wassermann reaction was positive + + and the Kahn test + + + +. The blood counts were up to the normal and an eosinophilia of 5 per cent. was present. In the fæces trichuris eggs (17 per c.cm. by the floatation test) were present.

As the patient came from the same district as that of the case we reported in our previous paper,[1] it was decided to continue the study of the embryonic periodicity of the *F. bancrofti* with a further series of accurate counts over consecutive four-day periods. The same technique as described in the previous case was again used, but in order to make these observations correspond with the earlier work on the subject, Low's standard[2] 20 c.mm. of blood was used as the amount for each count.* Thick wet film embryo counts were again found to tally within 0·5 per cent. of error factor against dry film counts.

LABORATORY REPORTS AND FILARIAL COUNTS

We are much indebted to Mr. Walters for the very careful and accurate observations carried out on the case. This involved sitting up for many nights, taking the blood at two-hourly intervals and counting thousands of embryo filariæ.

The first observation was one of four days of two-hourly counts taken consecutively from 2 P.M. on March 20th, 1933, until 12 noon on March 23rd, and it illustrates the regularity of normal nocturnal periodicity (Fig. 1). It will be noted that the peaks of the waves were reached at 2 A.M. on the first two nights, but came forward to 12 o'clock midnight for the third and fourth nights. This small discrepancy may be due entirely to experimental error or, more likely, to the fact that the patient fell asleep earlier on the third and fourth nights than

* This is double the amount used in our previous paper (March 4th, 1933).

on the first and second, thus giving an impetus to an earlier influx of embryos.

The second observation was also one of four days of two-hourly counts taken consecutively from 2 P.M. on March 27th, 1933, until 12 noon on March 30th, and illustrated an attempt to influence the periodicity of the embryo filariæ by means of reversing the life habits of the patient.

A meal was given to the patient at 11.30 A.M. on March 27th; slept from 2 P.M. to 5 P.M.; awake but drowsy at 6 P.M.; slept from 8.45 P.M. to 12 midnight. Patient roused at 2 A.M. and given a meal; taken for a short walk from 2.30 A.M. to 3 A.M.; back to bed at 4 A.M.; awake until 7 A.M.; slept from 7 A.M. to 9 A.M.; given a meal at 11.30 A.M.

This was the routine strictly adhered to over the four-day period of the experiment, and it will be seen that the patient was resting or asleep from 12 noon until 12 midnight during each successive 24 hours. The graph of results showed no irregularity during the first day; a slight flattening out of the curve between midnight and 6 A.M. on the second day indicating a less rapid fall in the number of embryos; a marked irregularity on the third day, during which the patient was taken out for a car ride between the hours of 2 A.M. and 4 A.M. and kept awake longer until 6 A.M.; and a marked fall in the total number of embryos at midnight on the fourth day, counterbalanced by a marked increase of the total numbers at midday.

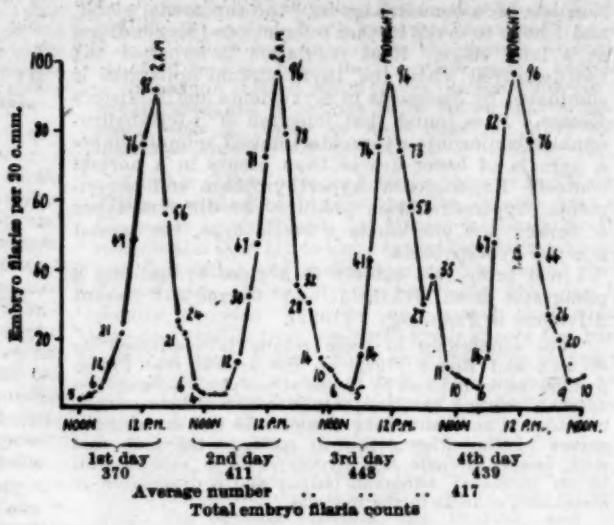
Reviewing this experiment it was decided that in order to achieve any satisfactory survey of the variation in embryonic periodicity in the patient's blood stream during the period of reversed life, it would be necessary to continue the observations over a period longer than four days. It was therefore decided to reverse the patient's life once more, but not to commence the observations until the fifth day as the first four days had already been done. In this way an eight day's chart was obtained. The reason for always selecting four-day periods was that the patient's fingers became very sore after being subjected to so much continued pricking.

Accordingly the patient was transferred to a room which was kept darkened during the day and artificially lighted all night. His meals were served at hours of the night corresponding with the usual day times, and between 12 midnight and 3 A.M. he was taken out for exercise and then given light duties of trivial tasks until 4.30 A.M. From then on he amused himself until 8 A.M. when he retired.

Counts were begun at 2 P.M. on the fifth day and were continued at four-hourly intervals for four consecutive days. Although every precaution was taken to ensure quiet rest for the patient, his sleep during the day was not so continuously sound as that during the night. He slept best during the period immediately after he retired—namely, from 8 A.M. to 12 noon, but after having been refreshed by this deep sleep he would mostly doze and sleep only lightly from noon until 6 P.M. when he breakfasted.

It will be seen (Fig. 2) that the first counts done during the fifth day show a marked increase in the number of embryos present at midday, there being 23 present as against an average of 5 in the normal curve seen in Fig. 1. Also, that the bottom point of the curve, denoting the smallest number of embryos counted, is reached at 6 P.M. as against 2 P.M. on the normal curve. This indicated a moving-on of the

FIG. 1



Total embryo filaria counts

cycle towards reversal. On the sixth day there was a marked decapitation of the peak of the curve showing the midnight counts increased to 59 embryos per 20 c.mm. of blood and the midday count increased to 67 embryos per 20 c.mm., whilst the bottom point of the curve is reached between 6 P.M. and 8 P.M. From the sixth day onward to the eighth there was no change in the patient's habits, and he continued to sleep well from 8 A.M. to 12 noon and then lightly doze and sleep until 6 P.M. Correspondingly there is little or no change to be observed in the curve. The peaks of the curves for the seventh and eighth days remained decapitated and the midday and midnight figures run in comparatively close parallel.

The total number of filaria embryos which appear during each 24 hours is the next interesting and suggestive observation. In the normal curve (Fig. 1) the total embryo counts are as follows: first day, 370; second day, 411; third day, 448; fourth day, 439. These figures give an average number of 417 embryos per 24 hours over a period of four normal days and nights. During the first four days of the reversed life experiment, the total embryo counts were: first day, 466; second day, 416; third day, 452; fourth day, 401; giving an average number of 434 embryos per 24 hours over a period of the first four days and nights of reversed life.

Continuing the foregoing observation, the total number of embryonic counts from the fifth to the eighth day of reversed life are: fifth day, 472; sixth day, 503; seventh day, 463; eighth day, 415; giving an average number of 463 embryos per 24 hours over a period of fifth to eighth days of reversed life.

The average number of embryos counted during every 24 hours throughout the eight days is 448 per 20 c.mm. of blood, and the average shown in the normal curve (Fig. 1) is 417. The difference between these two average figures is negligible from the experimental point of view, but the curves are vastly different. In the normal curve the peaks are regular and appear between 12 midnight and 2 A.M., whilst the minimum counts occur at 2 P.M. From the sixth to the eighth day of reversed life the curves fail to peak, the midnight to midday counts are nearly identical, and the minimum counts occur at 6 P.M. to 8 P.M. Therefore it seems most likely

that the same numbers of filariæ embryos are always poured into the blood stream every 24 hours, no matter what variation of sleeping and waking of the patient is brought about, and this experimental evidence points strongly to daily migration and reappearance of the same undamaged embryos *rather than to regular death and exact numerical parturition of embryos by the adult female* worm or worms. It seems most unlikely that female *F. bancrofti* should give an even yield of embryo when subjected to adverse circumstances.

Two weeks after the termination of the reversed life experiment the embryos were found to have returned to their normal nocturnal periodicity as shown in Fig. 1, and then the following animal inoculation experiment was kindly carried out for us by Dr. H. M. Hanschell. At 1 A.M. 20 c.mm. of blood was taken from the patient in the usual manner and the embryos were found to number 92; 5 c.cm. of blood was removed from the median basilic vein of the patient and immediately transferred to the heart of an ether anæsthetised guinea-pig. The animal fully recovered inside of three minutes, and 20 c.mm. of blood was then taken from the marginal vein of the ear and examined for embryos; none was detected. Five minutes after the transfusion the animal was killed by means of a sudden sharp blow on the back of the neck and a post-mortem examination was held at once. The heart was first punctured and 20 c.mm. of uncoagulated blood removed for standard thick film preparation. Smears were then prepared from the heart, lungs, liver, spleen, kidneys, and brain, and the respective tissues sent to the laboratory for sectioning. No embryos were detected in the marginal-vein or heart-blood films, and none in serial sections made right through the organs. Thus 23,000 live filarial embryos were transferred into the heart of the guinea-pig and five minutes later no trace of them could be found in the heart-blood or organs of the animal!

Further experiments to observe microscopically the action of guinea-pigs' blood on the embryos were planned, but unfortunately the patient, having become again fit for work, was obliged to leave hospital and rejoin his ship. Thus we were unable to ascertain whether the embryos were destroyed immediately when transferred to the guinea-pig or not; but it is certain that if they were not destroyed they had not migrated to any of the principal organs, which were thoroughly examined.

For the further elucidation of this, which we considered a crucial matter in the periodicity problem, further experiments on a more extended scale are necessary. What is it that determines the sudden death and disintegration of the embryo in incompatible blood in the guinea-pig? Bahr's experiments in Fiji on the embryo filariæ on a slide show that they are capable of remaining active and unchanged in their morphology in compatible human blood as long as three weeks, and the same phenomenon has been found to hold true for *Loa loa* embryos; but the moment they are transferred to incompatible blood they perish; it is to our minds inconceivable that in the normally infected filarial subject a similar rapid destruction takes place, when at the same time it can be proved that the filarial embryo are capable of living in the blood of the same patient outside the body and under artificial conditions for several weeks.

The following points have been brought out by these observations:—

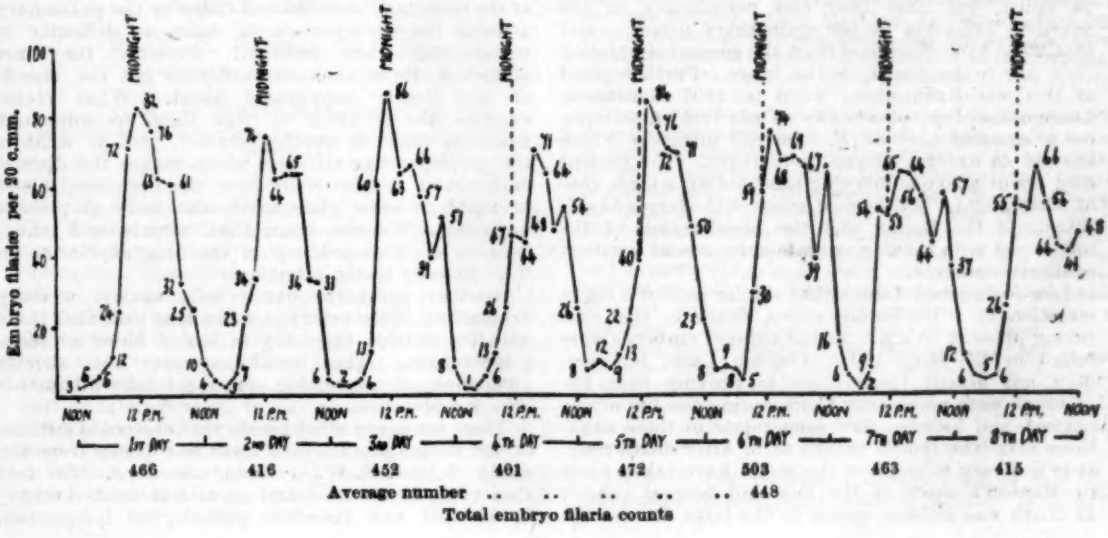
(1) That the curves illustrating this paper indicate to our minds still more emphatically than in our last paper that the phenomenon of periodicity is in some manner dependent upon the habits of the human host.

(2) That the curious phenomenon, so far termed "reversed periodicity," is probably not the correct interpretation. "Irregular periodicity" would be more correct, and the same irregularity can be seen on an analysis of Mackenzie's original case in blood taken every three hours under a ½ in. cover glass.[5]

(3) The type of "irregular curve" shown on the sixth, seventh, and eighth day in Fig. 2 is similar to that obtained in the non-periodic Fijian filaria,[6] and we consider it very necessary that similar observations should be carried out in the Pacific Islands with accurately measured quantities of blood—namely, 20 c.mm. It is hoped that an early opportunity will present itself of continuing this work on the non-periodic *F. bancrofti*.

(4) Another significant fact, as shown in the figures, which also emerges from the observations of Mackenzie, Yorke, and Blacklock, and Smith and Rivas, is that the minimal number of embryo filariæ

FIG. 2



in the circulation, whether in reversed or in normal life, occurs at about 6 P.M., and what is the exact significance of this can, at present, only be conjectured.

THE MECHANISM OF FILARIAL PERIODICITY

As regards the mechanism of filarial periodicity, Clayton Lane has recently written upon this subject extensively.[5] As he says:—

"Periodicity in *Filaria bancrofti* is evidently produced in one of two ways. Either there exists in the circulation a fixed or almost fixed filarial population which shelters in some internal part of the body during the day and reaches the cutaneous capillaries at night only, or parturition is so timed that microfilariæ enter the blood stream at night only. The latter alternative implies, first, simultaneous cyclical parturition, using the term with the same loose regard to exactness as occurs in the reference to simultaneous cyclical sporulation in the tertian or quartan malaria parasites; and, secondly, daily death of the cyclical brood."

Manson considered these two theories over 50 years ago and came to the conclusion that the first was the correct one. To try to prove this he experimented on dogs infected with *Dirofilaria immitis*.[6] In such an infection there is a certain periodicity though not so perfect as in *F. bancrofti*. Embryos are never entirely absent from the peripheral blood, though their numbers are always greater during the evening and night than during the day. The time of greatest scarcity is in the early morning. Having discovered this Manson took an infected dog and examined a drop of its blood at 6 A.M., this showing 82 embryos. He then administered a dose of prussic acid, did an autopsy, and counted the numbers of embryos in drops of blood from the different internal organs. The slides from the lungs (three in number) showed enormous numbers of embryos—viz., 4582, 1591, 2738.

In the heart of the dog four female and three male adult worms (*D. immitis*) were present. Of the four females three were found to be crowded with embryos at all stages of development, whilst in one the uterine tubes were found to be quite empty, save for a few dead embryos near the vaginal opening and the debris of a former pregnancy.

Taken in conjunction with the register of embryos free in the blood at different times of the day, he concluded that the embryos of *D. immitis* do not die or disappear after a short existence of less than 24 hours, but that they rest periodically in the minutest branches of the pulmonary artery; and that when they disappear from the general circulation they are to be found in the lungs. Further proof of this was forthcoming when in 1897 Manson in London had the opportunity to conduct an autopsy on a classical case of *F. bancrofti* infection which showed an exact nocturnal periodicity. The patient died about 8.30 one morning after taking a large dose of prussic acid. At the post-mortem the larger blood-vessels of the thorax and the blood-vessels of the lungs, just as in the dog, contained enormous numbers of filarial embryos.

Low [7] described a somewhat similar case of a slight infection in a Barbadian negro, death in this case taking place at 10 A.M. At the autopsy embryos were found in the lungs only. Clayton Lane, however, does not accept these cases as proving that the embryos were necessarily there during the life of the patient, and believes they accumulate in these situations from the lymph trunks at or after death only. It is not easy to see how this could have taken place in Manson's cases of the dog and human subject as death was sudden, owing to the large dose of the prussic acid taken, and therefore all the embryos must have been immediately immobilised. Even if the embryos had escaped in these poisoning cases or remain alive in cases dying of ordinary causes, how could embryos enclosed in a sheath find their way from the periphery, from the legs and arms, into the large vessels of the thorax and lungs after the circulation has stopped and the blood and lymph are no longer flowing.[8] Clayton Lane believes it is physically unthinkable that filarial embryos can hold their position in the overwhelming current of the large blood-vessels, and likens this to a man keeping his position swimming against the current half-way down the Niagara Falls. The fact nevertheless remains that apparently they are able to do so as the following experiment shows. The peripheral blood of a Barbados blackbird (*Holoquiscalus fortirostris*) when examined at 10.45 A.M. showed only one filarial embryo in an ordinary thick film. It was then killed, its thorax opened, and blood was taken from the right heart, which was still beating. Over 200 filarial embryos, in a similar thick film, were counted, and in blood from the lungs over 50. This experiment, together with other and later observations made upon *Dipetalonema perstans*,[9] in Uganda, seem to us to point to a seat of special selection in these organs, especially in the lungs. Why embryos should be able to hold their own against the currents of blood in the heart and large vessels is not clear, but it is a fact that they do. The same is true for the adult *Dirofilaria immitis* of the dog which live in the right ventricle of the heart, and which must have taken up their position there, as far as we know, on entering the definitive host after quitting their intermediary, the mosquito.

Indeed, here we are driven back to one of Manson's original suggestions based upon his observations on the filariæ of the Chinese black-necked grackle (*Gracupica nigricollis*),[6] that the embryos are provided with an oval spicule and surrounding papillæ by means of which they are able to adhere to the blood-vessel walls, and it is probable that the human embryo filariæ do the same thing. It is a common observation that embryo *F. bancrofti* are able to adhere to a coverslip and to clumps of red blood corpuscles by this means, and no other use has been suggested for this particular organ, save as a means of anchoring the embryo to the capillary wall.

Further, there is no violent current in the capillaries of the lungs, and once carried there by the pulmonary arteries the embryos should have no difficulty in maintaining their position. Possibly they are attracted there chemotactically to get the benefit of the freshly oxygenated blood. What factor supplies the stimulus to urge them to come out again at night is another matter, just as what is the corresponding stimulus which makes the diurnal embryos of *Loa loa* retire from the peripheral blood at night to some place inside the body at present unknown. We also know that ascaris and ancylostome larvæ are held up in the lung capillaries on their journey to the intestine.

Another point, to our minds, against a daily destruction of the embryos, is the long time that these will live outside the body in sealed blood at room temperature. The conditions are not strictly analogous, of course, but one must take all factors into consideration.

There are many other points that one could criticise in the deductions Clayton Lane has drawn from the study of Prof. F. W. O'Connor's sections. The fact that adult filariæ are found all with their uteri empty in blocked and therefore pathological lymphatics,

does not necessarily mean that this is what takes place when the parasites are inhabiting normal lymphatics. As has often been pointed out, heavy blood infections with embryos may not be associated with any observable pathological lesions at all. There are other strange happenings in *F. bancrofti* infections which are not easy to explain. The counts described in the paper show that the total number of embryo filariæ present each 24 hours appears to be constant, regardless of external conditions, and if one does systematic counts with measured blood every night over weeks and even months, one finds that the nightly number of embryos may vary very little. This, we hold, indicates a more or less constant stream of embryos emerging from the uteri of the adult worm daily, with a corresponding destruction constantly going on, otherwise how account for the constant figure.

There are many other points awaiting solution in *F. bancrofti* infection; more extensive study of the non-periodic human filariæ and further accurate studies on the *Dirofilaria immitis* of the dog are required. When these have been accomplished then we may learn something more about the strange phenomenon of periodicity. For the moment we, just as Manson did some 50 years ago, believe that filarial periodicity is best explained by parturition going on more or less continuously, the young being, as Manson put it, nearly constantly carried along the lymphatics and thoracic duct to the blood, while the excess that would in time take place is checked and kept more or less constant by a mortality amongst the older and effete embryos.

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TREATMENT OF EXOPHTHALMIC GOITRE WITH DEEP X RAY THERAPY

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IN all, 61 cases are included in the present series. The minimum period since commencement of treatment is three years and the maximum period of subsequent observation nine years. So far as is known, no series of cases treated by deep therapy has hitherto been published, and although successful cases treated by ordinary X rays have been reported from time to time, notably in this country by Dr. Florence Stoney,[1] yet the general impression has been that such treatment, to say the least, is uncertain. A note on a further 40 cases is appended, in which more recent treatment has been given.

Twenty of the combined cases were directly under the care and observation of one of us (E. P. P.) who classifies and reports upon them as shown in Table I.

TABLE I

Case.	Sex.	Age.	Length of history (years).	B.M.R., per cent.	Time since treatment (years).	Gain in weight, (lb.).	Improvement.	Class.
1	F.	40	10	60	7	0	L.	2
2	F.	52	½	0·2	4½	2½	G.	3
3	F.	48	1½	0·5	3	6½	,,	2
4	M.	43	½	37·3	6	19	,,	1
5	F.	44	5	28·3	3	46½	,,	1
6	F.	30	1½	102	2½	21	,,	1
7	F.	45	10	39·1	2	11	,,	1
8	M.	52	2½	26·2	4	12	,,	1
9	F.	38	½	41·2	7½	10	,,	1
10	F.	53	—	40·4	5	39	,,	1
11	F.	45	4	69·4	6	—	,,	3
12	F.	36	½	0·4	2	32	L.	2
13	M.	16	1½	43·6	8	19	G.	2
14	F.	53	½	0·3	2	26	,,	1
15	F.	56	1	31·4	2	24	,,	1
16	F.	29	1	21·1	5½	—	,,	2
17	F.	22	2	0·6	7½	9	,,	2
18	F.	27	½	53	7	13	,,	2
19	F.	60	½	22·1	3½	—	,,	1
20	F.	38	2½	0·6	2½	10	,,	1

L. = little and G. = great improvement.
Remarks.—Case 1: Rheumatoid arthritis. 2: Auricular fibrillation for 2½ years. 7. Mild diabetes. 11. Mitral stenosis. 16. Treatment not completed.

The results of treatment are tabulated in two ways. Patients were asked to state whether they considered they had improved greatly or a little or not at all since treatment had been begun. From this point of view the results are gratifying, as 18 out of 20 stated that their improvement was "great." The final column of the Table gives results in accordance with Dr. F. R. Fraser's classification.[9]

Class 1.—Patients who can do full work.

Class 2.—Patients who can do their work with difficulty or are obliged to do lighter work.

Class 3.—Patients who are obliged to lead an invalid life.

The present state of the patient has been taken as the only criterion. No difference has been made even though a present disability might not be thought to be due to the original thyroid disease. It has the disadvantage of making the outlook a little more unfavourable, as is illustrated in the following two cases.

Case 2 (Class 3). A year later her only symptom was occasional tachycardia; all other signs had disappeared. But the concurrent rheumatoid arthritis was worse and she was crippled. Case 11 (Class 2) was admitted for further treatment in April, 1933. She was found to have developed mitral stenosis, which caused some disability. There were no signs of hyperthyroidism. The B.M.R. was + 2 per cent.

The first patient (Case 13) was a boy who had previously been treated with ordinary X rays and whose age, 16 years, is generally considered a contra-indication to operation. He was treated first in April, 1924, when a dose of 25 per cent. was given to the thyroid gland. He was treated six times in all between April, 1924, and March, 1928. His basal metabolism before treatment was + 43 per cent. At Christmas, 1932, he wrote stating he was working at Pickford's lifting sugar, milk, and other heavy articles without trouble. In July, 1933, he was lifting packages of 1 cwt. and over; his only symptom was at times a tightness of the throat with extra heavy effort. As a result of these repeated small treatments on top of his previous ordinary X rays he developed a capillary telangiectasis of the skin over the thyroid. In the light of further experience the treatment given was much too light and too often, although the end-result was satisfactory.

Deep X ray treatment suffers perhaps one disadvantage as compared with operation. It is only

in the mildest cases that a single treatment is required, consisting of a series of four exposures spread out over a week or ten days. The second treatment follows in two or three months; but the patient may feel so well by now that she refuses to give up further time to treatment in hospital. The surgeon, on the other hand, usually aims at a cure after a single operation.

Case 16, a nurse, was one of this kind; her symptoms were more severe than is indicated by a B.M.R. of + 21 per cent. Her pulse-rate was 120, and she was so weak that towards the end of the day she could not walk upstairs without holding on to the banisters. She only had one treatment of three exposures in October, 1926. She was seen two and a half years later because she wanted to pass her Central Midwives Board examination and she was not allowed to enter without a medical certificate. She said that she did not now feel any weakness. She became hot on exertion, but there was no palpitation. The beat of the heart was forcible and the pulse-rate 120; there was some exophthalmos. She was given the certificate but was told there was some activity of the thyroid still present which it would be advisable to treat. She wrote later saying she had been allowed to continue her training. In March, 1933, she wrote that her eyes were prominent, she was shaky after exertion or excitement, and the pulse-rate was quick after exertion. The neck was not swollen. Apart from these symptoms she had been very well indeed for the past two years. Since November, 1932, she had been night sister; she did not think she could do heavy nursing which entailed lifting. She falls into Class 2, but with further treatment might have been graded higher.

Case 9 illustrates the very gradual improvement that may take place in a patient insufficiently treated, and the improvement in this case was not attributed by the patient to the treatment at all, although Dr. A. C. Lewis, of Rochford, wrote three years afterwards that she had been in very good health since her treatment at Guy's for a goitre which was much smaller, and that she did not have attacks of tachycardia. The patient wrote in 1931 as follows: "You state you are trying to assess results from the treatment; I think it only right to tell you that I do not honestly think I derived any benefit from it, and for that reason I did not return for the third treatment. I did not notice any change in my condition until late in 1927 (last exposure June 4th, 1926); I apparently got stronger after that and gradually regained my normal health. I have not filled up the form you enclosed, under the circumstances. Whilst in the hospital every kindness and courtesy was shown me, for which I was very grateful; but feeling as I do about the treatment I think it fairer to write and say so." She has been placed in Class 1!

Case 18, another nurse, may be taken to illustrate the criteria for Class 2. She came first under treatment in January, 1926, and she had six small treatments up to May, 1927; at the present time she would be treated more vigorously. At the end of 1927 her B.M.R. was + 9·5 per cent. and no further treatment was advised. She writes that in March, 1933, she has palpitation at times with breathlessness and slight shakiness; she walks upstairs slowly. In 1932 she did heavy surgical nursing for five months; it is during these times that she becomes conscious of her heart if she gets overtired. She adds that she is very well indeed on the whole. She has been placed in Class 2.

TREATMENT (BY W. L. W.)

There was little to go on except previous experience with ordinary X rays. Tentatively a total depth dose of about 25 per cent. of the skin erythema dose was tried. It was found that two, three, or even more treatments were necessary. The depth dose was then increased to about 50 per cent. and, as this was found to be well tolerated by the thyroid, the total amount was gradually increased to what was formerly called the sarcoma dose—a depth dose of 80 per cent. S.E.D.—and for the past years this has been more or less the standard. With this dosage in the milder type of the disease one treatment only and in the severer type two treatments are usually sufficient. This massive treatment is practically a bloodless operation and the quickness of results apparently equals that of surgery, so that one of the chief claims of the latter is more or less neutralised.

It is interesting to note that five cases in the series had previously been treated with ordinary X rays without any marked benefit. This only confirms what the writer has already observed in the leukæmias and in Hodgkin's disease: that cases which had ceased or failed to respond to ordinary X rays will still improve if treated by deep therapy. In time it may be possible to determine the optimum wave-length for any particular disease. That toxic goitre is apt to recur is evidenced by the fact that post-operative recurrences are stated to be from 5 to 20 per cent. according to the experience of different observers. In this series six cases were of this class, and treatment by deep therapy was found to be very effective.

Adenomas, if associated with severe symptoms, would probably be safest treated by deep therapy first, and if it caused disfigurement subsequent removal could be carried out. One case in the present series was operated on one year after the deep therapy and is quite well to-day. There was an interesting case of recurrent adenoma. The patient had previously been operated on three times and refused to have any further operation; she came with a history of toxic symptoms for the previous nine months. She had three large adenomas the size of hen's eggs and several smaller ones. As the result of treatment the toxic symptoms disappeared, the large adenomas have slowly diminished to about one-half their original size, and the smaller ones are barely palpable. No new ones have appeared in the four years she has been under observation, and although the patient could obviously be benefited from the æsthetic point of view by surgical removal, she refuses.

END-RESULTS

Consideration of the cases shows but little difference in the final result whether the patients were treated (as originally) with comparatively small doses repeated as necessary or with the present massive dosage. It is in the time taken to achieve the result that the great variation is found. In all those who depend upon their own effort for a livelihood, or who are the mainstay of their home and family, early recovery is of the greatest importance. For this reason the massive dosage is the best. The earlier the treatment the more satisfactory is the result likely to be. The longer the delay the greater the strain on the heart and the slower the recovery. In the severer cases at least a year should be allowed. Surgical treatment was considered in two cases. One patient (Case 13), owing to the slowness of recovery, was examined by a surgeon, who was unable to operate owing to the condition of the skin; this showed a telangiectasis of fine capillaries involving the thyroid area, which was the result of further treatment after previous ordinary X rays. The other patient was advised operation by the surgeon but refused. Both these have subsequently made marked improvement and are well to-day. Rest is an important element in quick recovery, but in many cases, from the very nature of the surroundings, it is very difficult to obtain. One month should be the minimum in all cases.

SUMMARY

The results given in this paper compare very favourably with other published results. It is to be noted that not one patient has died of the disease up to the present.* If further experience bears out these results, the treatment of exophthalmic goitre by deep therapy should become a very formidable rival to any other method.

Ambulatory cases.—Where early recovery is important a full "sarcoma dose" should be given. If time is not a factor, medical treatment may be followed later by radiation if there is failure to improve. A treatment consists of a series of four radiations—right, left, front, and back—spread over five to seven days, with the patient in bed. Total depth dose = 80 per cent. S.E.D.

Severe cases.—If associated with adenoma, preliminary radiation and later removal when a source of annoyance are advised. With general thyroid enlargement radiation is given and should be repeated in two to three months if necessary. With no marked improvement in one year, then either surgery or further radiation is indicated. A treatment consists of a similar series spread over eight to ten days. Total depth dose = 90 per cent. S.E.D. to allow for dispersion.

Grave cases.—Combined medical treatment with radiation is given.

Recurrences.—Radiation is usually successful in post-operative recurrences. If recurrence takes place after previous radiation then either a further treatment or surgery is necessary. In very grave cases a series of five radiations is advised, four as above and one extra to the whole thyroid region from the front, spread over five to six weeks. Total depth dose = 100 per cent. S.E.D.

TABLE II.—*Published Results*

Treatment.	Observers.	Cases	Percentage in each class.			Deaths.	
			1	2	3	Hosp.	Later
Surgery.	Mayo Clinic	677	65	12·5	5·5	3·5	15
X rays.	German Stat.	754	66	14	1	—	—
X rays.	Sielman (*a*)	328	50·5	40·5	5	—	—
X rays and rest.	Solomon	100	70	27	3	—	—
X rays.	Stoney (*b*) [1]	176	45	37·5	12	—	5·5
Medical.	Campbell [2]	88	37·5	33	12·5	9	8
Medical.	Fraser (*c*) [3]	64	36	23·5	4·5	4·5	36
Surgical.	Fraser	72	61	28	3	8	—
Deep X rays.	Poulton (*d*)	20	55	40	5	—	—
	Poulton and Watt (*e*)	61	60·6	29·5	9·8	—	—

Remarks.—(*a*) Includes 4 not traced and 36 post-operative. (*b*) Not all deaths due to Graves's disease. (*c*) Duration not given of fatal cases. (*d*) Duration 2½ to 8 years. (*e*) Class 3 includes 3 doubtful cases.

ADDENDUM

Forty additional cases have been treated between July, 1931, and July, 1933. It is too early to assess permanent results, but they show:—

In 22 cases marked improvement = 55 per cent.
,, 14 ,, definite ,, = 35 ,, ,,
,, 4 ,, no change = 10 ,, ,,

This list includes one patient with a history of severe symptoms for 30 months who had lost 5 st. in weight and had severe cardiac symptoms and was for months continuously under digitalis. She improved rapidly but her doctor reported her death some 13 months later. He stated that the toxic symptoms had completely disappeared, but that she died of angina associated with jaundice.

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* A patient with a history of chronic phthisis, marked cardiac complications, and severe toxic symptoms was treated in August, 1933. She was reported to have died about two months later and it was stated that the treatment had had no effect in arresting the progress of the disease.

VAPORISED IODINE WITH BIER'S MODIFIED HYPERÆMIA

IN TREATMENT OF PYOGENIC CUTANEOUS AFFECTIONS

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Bier's modified artificial hyperæmia and the germicidal powers of iodine, conjointly used, are proposed as a local treatment for the follicular pyodermias and for the more obstinate non-follicular pyogenic infections. The rationale of these procedures may be briefly stated as follows.

Bier's Modified Artificial Hyperæmia.[1]—Normally the task of the blood is to circulate through the tissues of the body and to maintain therein the various physiologic functions. In Bier's conception, the phenomena of inflammation represent the effort of the circulatory blood to resist the harmful invasion of the body by disease. The redness and swelling of inflammation result from the increased activity of the circulatory blood and the exudation of serum—measures adopted to neutralise the harmful effects of the causative agent as well as to increase the nutrition of the involved structures in the hour of danger. Necrosis in its various forms means that the human structure has been incapable of coping with the particular disease; while disappearance of the inflammatory phenomena means the completion of the victorious fight of the stimulated blood current. The aim of Bier's artificial hyperæmia is to increase and fortify the normal beneficent inflammatory hyperæmia of the body in its time of need.

Bactericidal Properties of Iodine.—Iodine in the form of a tincture has enjoyed and is enjoying a unique favourable position as a cutaneous antiseptic. Simmons,[2] using modern bactericidal investigative methods, studied the effects of alcoholic solutions of iodine (both half and full strength tincture) upon certain bacteria, both in vitro and in actual skin disinfection experiments. The pathogenic bacteria used were: *Staphylococcus aureus, Streptococcus pyogenes, Streptococcus scarlatinæ, Escherichia coli, Clostridium welchii* (spores), and *Bacillus anthracis* (spores). Simmons summarised the results of his laboratory studies as follows:—

1. The bactericidal efficiency, in vitro, of 3·5 per cent. alcoholic iodine solution was greater than the various mercurochrome solutions tested. Full strength iodine tincture was more efficient than the half strength.

2. Iodine gauze placed on the inoculated surfaces of nutrient or blood agar culture of the test organisms resulted in larger areas of growth inhibition as compared with the mercurochrome gauze.

3. In disinfection experiments on normal rabbit skin inoculated with cultures of the test organisms, iodine in 3·5 per cent. strength killed the organisms in and on the skin in 22 out of 42 tests, and in the other 20 the number of viable germs was greatly reduced.

4. Previous tincture of iodine application protected white mice against *B. anthracis* spores inoculated subcutaneously.

The latest contribution by Simmons[3] on the bactericidal superiority of iodine consisted of observations of its effect on skin abrasions, superficial incisions, and deep incisions, contaminated with undiluted broth cultures of either the *Staphylococcus aureus* or the *Streptococcus pyogenes* for various periods of time. Application of tincture of iodine to 151 wounds contaminated with staphylococci resulted in

the following percentage of sterile cultures: abrasions, 83·4 per cent.; superficial incisions, 83·1 per cent.; and deep incisions, 31·2 per cent. The use of the tincture of iodine on 59 wounds contaminated

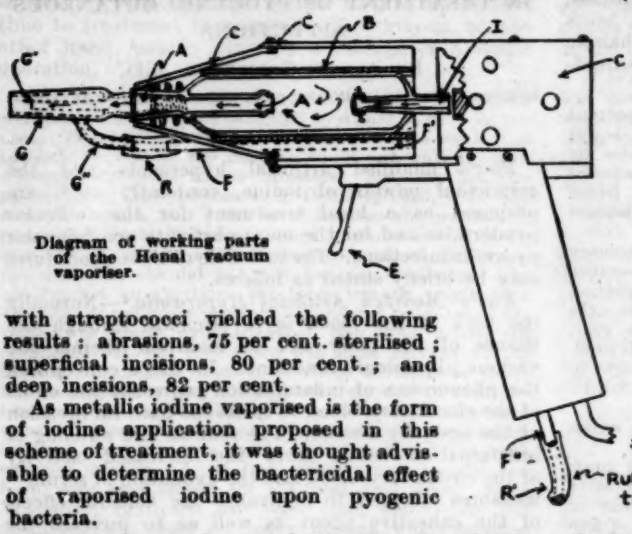


Diagram of working parts of the Henal vacuum vaporiser.

with streptococci yielded the following results: abrasions, 75 per cent. sterilised; superficial incisions, 80 per cent.; and deep incisions, 82 per cent.

As metallic iodine vaporised is the form of iodine application proposed in this scheme of treatment, it was thought advisable to determine the bactericidal effect of vaporised iodine upon pyogenic bacteria.

The organisms used were cultures of the *Staphylococcus aureus* and of the *Streptococcus hæmolyticus*. The plan followed in these experiments was similar to that employed for the determination of the fungicidal properties of iodine. Filtered plain broth cultures of these cocci 24 hours old and of various strengths were enclosed in collodion sacs and suspended in the Strickler-Borneman apparatus,[4] and the vaporised iodine was delivered by the Henal vacuum vaporiser.[5] Six shots and a vacuum of 15 inches was the routine procedure, and each culture was kept in the iodine atmosphere for one hour prior to incubation. The cultures were observed for ten days, then subcultured by placing 1 c.cm. of the contents into a flask containing 100 c.cm. of Harmone broth. (This is an infusion beef medium made by a process in which digestion takes place in the ice-box.) Inhibition tests were done on each culture. Presence of iodine on the inside surface of the sacs as well as in the enclosed fluid cultures was determined routinally by the starch test. A control culture was used with each group of experiments.

A résumé of the bactericidal results is given in the accompanying Table.

Iodine Bactericidal Experiments using the Strickler-Borneman Apparatus and the Henal Vacuum Vaporiser

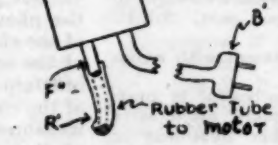
Culture dilution (per cent.).	Incubation period (days).	No. of expts.	(a) Results. (b) Control results.	(c) Time exposure to iodine vapour. (d) Presence of iodine vapour in culture fluid and in sac.	(e) Results of subculture. (f) Results of inhibition tests.
Staphylococcus aureus					
2·5	10	2	(a) No growth. (b) Growth 24 hrs.	(c) 1 hour. (d) Starch test positive for both.	(e) No growth. (f) Growth present.
5		3			
10		2			
20		1			
50		1			
100		2			
Streptococcus hæmolyticus					
5	10	1	(a) ditto (b) ditto	(c) ditto (d) ditto	(e) ditto (f) ditto
10		1			
20		1			
50		1			
100		2			

Note.—It is most important to place considerable powdered metallic iodine in the retort of the Henal Vacuum Vaporiser so as to obtain quite a heavy iodine vapour.

THE HENAL VACUUM VAPORISER

Description.—The essential parts of the apparatus are a Pyrex retort (see Diagram, A) enclosed in an electrical unit (B) designed to produce the exact temperature necessary to generate the vapour. Vacuum is created by an electrical motor apparatus and the produced vacuum is transmitted to the skin. The vapour is carried through special vacuum cups, one of which is shown inserted in the throat of the retort (A). The apparatus is connected at F to a vacuum line by means of a rubber tube (R), and the vacuum thus created passes through the apparatus through channels F' and F'' and the tubing R'. The entire apparatus is enclosed in an aluminium casing.

The technique of using the Henal vacuum vaporiser is as follows. A measured amount of the medicinal powdered substance is poured into the retort through a glass funnel especially provided for that purpose. The electric cord, part of the electric heating system, is connected either to an ordinary light circuit or to a circuit included in the motor vacuum apparatus, and about ten minutes are allowed for the attainment of a maximum efficiency heat. The vacuum motor pump is then started. The mouth of the vacuum cup (G) is placed against the skin, and the air inlet (I) is closed by pressing the trigger (E). Vacuum is thus produced by the instrument and with it the desired hyperæmic condition of that area of the skin is covered by the mouth of the cup. On releasing the trigger (E) the air inlet (I) is opened and the atmospheric pressure drives the vapour from the retort channel (A) through the directing tube (G) and against the treated area. This procedure can be repeated on the same area as often as desired. Cups varying in design have been found best suited for treatment of various surfaces, as satisfactory creation of the vacuum depends on the snugness with which the cups are applied to the surface of the skin. It is most important to avoid air pockets between the margin of the cup and the surface of the skin. A set of five cups has been devised and found ample for treatment of any cutaneous surface.



In attaching the suction cup (G), the grinding is first slipped into the throat of the retort (A). Care should be exercised not to use too much force, for if the cup becomes jammed considerable difficulty will be experienced when it is desirable to change the cups. Each of these cups has a slim tube (G'') which connects with a piece of rubber tubing (R). The other end of the rubber tubing (R) is connected to a slim tube (F) that is part of the vacuum system. It is necessary to exercise a little care when connecting G'' to R. When the apparatus becomes too hot it is urgent to disconnect the current for a few minutes, and then restore the circuit. The presence of an excessive amount of crystalline substance on the skin indicates that there is too great heat, but lack of vapour shows insufficient heat. The apparatus may be refilled at any time, but when it is recharged while hot it is best to rotate the instrument for a few minutes to ensure even distribution of the powder in the retort.

Care of the Apparatus.—After giving a number of treatments the operator will notice that the rubber tubing connecting the pump with the instrument has lost its softness and elasticity. This is due to a coating on the inside of the rubber tubing, the result of condensation of excess vapour drawn toward the pump. If this process is permitted to continue, it will eventually close the tube and prevent the production of a vacuum within the applied suction cup. It is necessary from time to time to renew the rubber tubing. In order to lengthen the life of this tubing and keep the air channels clear, it is necessary to rinse or clean the instrument once daily, provided a large number of treatments have been given.

The rinsing or cleaning is done by connecting a small section of rubber tubing (about 12 inches (30·48 cm.)) to the front part of the instrument at R. The open end of this tube is submerged in a cup of alcohol. The trigger (E) is pulled back, as when a vacuum is being created.

This will draw the alcohol through the instrument and down through the vacuum tube. To conserve the amount of alcohol used it is suggested simply to dip the tube into the alcohol for a few seconds and then withdraw it. This is repeated a few times. A small amount of alcohol going through at intervals tends to dissolve the deposit within the rubber tubing more efficiently. After the alcohol, lukewarm water is used in the same manner for the last rinsing. The 12-inch rubber tubing is then removed. It is used only for cleansing the instrument.

The same condensation that takes place within the lumen of the rubber tubing also forms in the interior of the suction cups, but it is even heavier, owing to the fact that the applicators are of lower temperature than the vapour. It is absolutely essential to cleanse the cups after every treatment, and after every application when exudate of pus or serum is present and finds its way into the cup. When serum, pus, blood, or epithelial debris clings to the applicating cup it must first be removed with cotton swabs saturated in water. The cup is then soaked in an alcohol bath, rinsed with warm water and allowed to dry. It is then again ready for use.

SCHEME OF TREATMENT

Carbunculosis.—In the treatment of carbunculosis the tissues about the border of the lesion, both the hyperæmic and the normal, are to be treated with the vacuum alone. The degree of vacuum should vary from 10 to 25 inches; the time of application, one-half to one minute to each area; the number of reapplications, two to four; and daily treatments at the start. The infected area is to receive vacuum applications of 15 to 20 inches plus the vaporised iodine. Two to three reapplications with time duration of 30 seconds each usually suffices. With the subsidence of the inflammatory symptoms the vacuum treatments about the lesions are discontinued, and more intensive application of the vaporised iodine and vacuum made to the central necrotic area. With the removal of the necrotic "core" this treatment is stopped, and either metaphen solution 1 : 2500 or a 3 per cent. aqueous solution of gentian-violet is applied.

The following history typifies the events in the treatment of a case of carbunculosis by this method.

History.—W. A. B., aged 58 years. Admitted to the Skin and Cancer Hospital of Philadelphia with carbunculosis of the neck. Duration: four weeks prior to admission. When condition first began patient noticed a small furuncle on the back of the neck, accompanied by pain, chills, and fever. The lesion was incised, but did not improve. The inflammatory area began to involve the entire neck and constitutional symptoms became more pronounced. During these four weeks various established antiseptic applications were applied locally.

Condition on Admission.—A large, swollen, elevated, inflammatory mass was present on the back of the neck, measuring 5 in. × 4 in. The centre was necrotic, pus oozed from multiple openings, and the surrounding tissues were tender, indurated, and dusky red. The posterior cervical glands were enlarged. The pain in the back of the neck was quite severe and the patient complained of chills and fever. Temperature was 100° F.; pulse-rate, 120; respirations, 22. Nothing abnormal was found in the urine. A blood count showed moderate leucocytosis (11,000). There was no hyperglycæmia (blood-sugar 88 mg. per 100 c.cm.). Culture of pus showed *Staphylococcus aureus.* Medical examination was negative. Blood pressure, 126/65.

Treatment.—Vacuum treatment begun on day of admission (Nov. 28th, 1933). Daily treatment given, and by Dec. 1st, after three treatments, all discomfort disappeared. Drainage of the multiple openings continued until Dec. 12th, and by the 24th the wound was completely healed.

Very large furuncles are treated by the same technique as that suggested for carbuncles.

Furunculosis.—A furuncle seen early usually yields to one treatment to the lesion of two applications of vaporised iodine with a vacuum of 15 inches. Advanced furuncles usually require three to five consecutive daily treatments of 15 to 25 inches of vacuum with vaporised iodine, and two to four reapplications to each lesion. The cup used for treatment should be sufficiently large to include the lesion as well as a portion of the adjacent skin. It is advisable, prior to treatment, to remove the epiderm overlying the infected follicle, as this facilitates more certain penetration of the vaporised iodine.

CASE I.—The patient, a diabetic, had a blood-sugar of 210 mg. per 100 c.cm., and the carbuncle had been present for three weeks before the author's method of treatment was begun (1). Twenty treatments were given. (2) Shows the beginning of healing. (3) Shows healing complete.

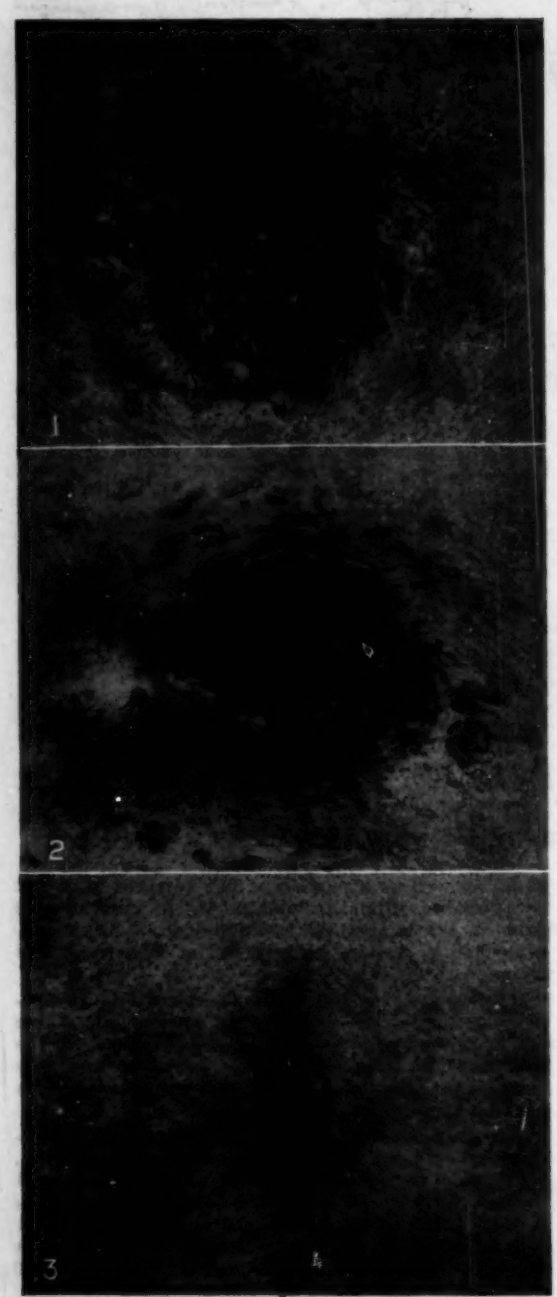
Abscesses.—This treatment has no direct favourable effect upon the course of an abscess. Its value lies in the necessity of only a small incision, for the vacuum will empty the pus contents and the vaporised iodine will antiseptise the cavity. No packing is required.

Non-follicular Pyodermias.—Such cutaneous affections as ecthyma, infectious eczematoid dermatitis, and dermatitis repens have been successfully treated by vaporised iodine and vacuum, provided constitutional factors are corrected if present. The affected part as well as the non-involved skin for a distance of several inches is to be included in the area of treatment. The vacuum recommended is from 10 to 15 inches to each area with three applications of the vacuum and of the vaporised iodine to each part of the affected skin. The time recommended for each application is from 10 to 20 seconds.

DISCUSSION

In advocating this method for carbunculosis it is important to weigh the advantages this procedure offers over other treatments—i.e., surgery and the X rays.

Surgery often calls for a general anæsthetic with its possibilities for dangerous complications, especially in subjects with severe vascular disease, advanced renal disease, or diabetes. There is also a small but definite surgical risk, necessity for skilful nursing, possibility of a long convalescence, and an unsightly scar. The value of X rays in carbunculosis depends upon the production of a mild hyperæmia. This treatment calls for the services of an expert and use of expensive apparatus, and perhaps, in the end, for surgical interference.



CASE II.—The patient, who had generalised lichen planus, developed a carbuncle over the lower dorsal vertebræ, and this reached 3 inches in diameter. (1) Shows the condition on Jan. 18th, 1933. He received 16 treatments up to Feb. 5th when healing began. (2) Shows marked circumscription of the lesion and the beginning of separation of necrotic material. (3) Shows healing completed.

The modified Bier's hyperæmia and vaporised iodine treatment is advocated both because of its logical experimental basis and the good results obtained. It has these advantages: simplicity of application with no special training required; absence of any risk; rapidity of relief from pain; speedy control of the septic phenomena when present; quick healing with but insignificant scarring. The aim of this treatment is to assist Nature in its effort to fight infection by increasing vascularity and favouring the interchange of blood in the congested area. Using iodine as the germicide, we are employing a remedy which clinically and in the laboratory has proven to be a dependable agent.

RÉSUMÉ OF CLINICAL RESULTS

Carbunculosis.—Fifteen patients with carbunculosis have been successfully treated by this method. The duration of the active treatment—i.e., up to beginning of healing—varied from 7 to 18 days. Constitutional evidences of septic absorption were not encountered. In some cases the pain subsided rapidly, and in others it was quite severe for a few days. Severity of the pain can be mitigated by warm metaphen (1 : 2500) application. The accompanying photographs illustrate the results of two patients with carbunculosis treated by this method.

Furunculosis.—Fifty patients with furunculosis have been successfully treated by this method. The inflammatory phenomena and the pain usually subside very rapidly. At times, however, the treatment appears to intensify the discomfort for a short while. Healing as a rule begins after three to five treatments. Dry dressings are used.

Non-follicular Pyodermias.—Six patients with obstinate infectious eczematoid dermatitis, two with ecthyma, and one with dermatitis repens were cured by this treatment.

At present we are treating a number of patients with rebellious sycosis vulgaris by the iodine and vacuum method. As a whole our results are not very encouraging. We are now planning to use X ray depilation of the affected area, and follow this by the vacuum vaporised iodine treatment. It seems logical that this method should succeed.

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PALMER MEMORIAL HOSPITAL, JARROW.—The closing of Palmer's shipyard and works has produced a critical situation for this hospital, the only one in the town. Its principal source of income has been the contributions from Messrs. Palmer's employees which for the last 11 years have averaged £1250 per year. This source of income has now ceased, and the hospital is in danger of being closed at the end of September. Should £500 be forthcoming the hospital could pay its way to the end of the year, which would allow time for the preparation of a scheme which, it is hoped, would enable it to go on. Three-fourths of the insured working in Jarrow are unemployed.

"CURIOUS BODIES" FOUND IN THE LUNGS OF COAL-WORKERS

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THREE years ago Tylecote and Dunn [1] gave an account of a case in which bodies resembling the "curious bodies" of asbestosis were found in the lungs of a coal-miner who had never worked in asbestos. He had worked in the coal-mines of Alabama and Lancashire. The "bodies" described by them simulated asbestosis bodies in shape and size and also in their abundance of free iron. The authors presumed them to be minute fragments of some inhaled iron-containing material which had undergone a chemical change under the influence of the body fluids. W. E. Cooke [2] in 1932 reported a case of "curious bodies" similar to those found in asbestosis occurring in a Lancashire coal-miner. He suggested that the formation of the "bodies" depended on the presence of silica and altered hæmoglobin. Last year Gloyne [3] stated that he had found these "bodies" in coal-miners' lungs "and in anthracosis." He considered them to be minute particles of carbonaceous material which occasionally had a deposit of yellow pigment around them, and thought them to be of no significance.

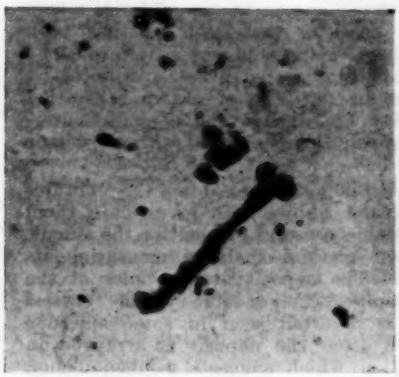

FIG. 1.—"Curious body" from a coal-miner's lung. (× 500.)

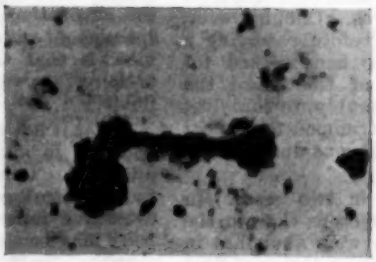

FIG. 2.—"Curious body" from a coal-trimmer's lung. (× 700.)

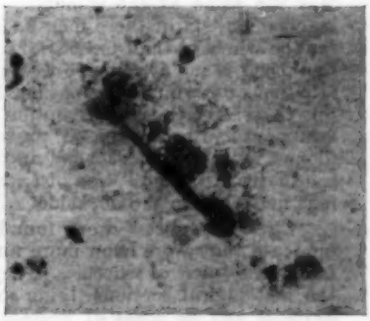

FIG. 3.—"Curious body" from the lung of a young woman. (× 400.)

This paper is based on the examination of lungs from 26 selected cases. I am indebted to Prof. J. B. Duguid and his staff of the Welsh National School of Medicine for the material. The lungs were obtained from autopsies on individuals who died at the Cardiff Royal Infirmary during a period of six months. The investigation was meant to be confined to coal-workers' lungs in the first place, but it was later considered necessary to include lungs from another type of person to act as controls. Sixteen of the coal-workers were miners and seven trimmers. Three "controls" were taken; two were women and one a salesman. The causes of death were various. In seven cases death was due to injuries. There was only one death attributed to silicosis with tuberculosis. In two others, both coal-trimmers, however, there was in certain parts of the lungs a marked degree of fibrosis which may have been a contributory factor to the cause of death.

1. The *technique* employed was similar to that described by Cooke.[4] Representative portions of lung were taken and cut into very small pieces. These were put into tap water which had been made alkaline with sodium carbonate. To each 10 c.cm. was added 1 c.cm. of liquor trypsinæ co. After digestion for three or four days at 37° C. the material was centrifuged. The deposit was washed with water and examined microscopically.

2. In some cases the following method was employed and found to be easy and very successful. Paraffin sections of the lungs were mounted on slides in the usual way. After treatment with xylol, alcohol, and water, each section was ringed with paraffin to anchor it. Several slides were immersed in an alkaline solution of trypsin and left in the incubator overnight. They were then washed with water carefully and the ring of paraffin removed with a needle. After drying thoroughly in an oven the sections were mounted in Canada balsam. On microscopical examination a network pattern of dust was seen in which "curious bodies" were easily found.

3. Blocks of lung were also fixed in formalin for routine histological examination.

MORPHOLOGY

Out of 26 lungs examined, "curious bodies" were found in eight, or 30 per cent. They were exceedingly constant in structure, consisting of a black, slender, rod-like core at the poles of which was a golden yellow deposit. The appearance was reminiscent of a collection of iron filings at the poles of a bar magnet. Sometimes there was also a pale yellow annulated encrustation around the core. Unlike the asbestosis bodies, they did not vary much in shape, nor did they appear to originate in granular amorphous material. They always had a spicule as their basic structure. A Prussian blue reaction for iron was given in every case by the golden yellow deposit at the poles of the body. The deposit failed to take any of the aniline dyes, but in some cases it stained black with hæmatoxylin. It stained a very deep yellow with iodine. When treated with 25 per cent. sulphuric acid, the core was left with a colourless faintly outlined ghost of the deposit. The "bodies" resisted prolonged trypsinisation. Neither the core nor the deposit was doubly refractile, although doubly refractile particles were frequently seen in the same lung debris.

Coal-miners' lungs.—Portions of lung from 16 miners were examined. It was difficult to obtain detailed "industrial histories" of these men. They had worked, with one exception, in the Eastern Glamorganshire coal-field. Fifteen were hewers and one a colliery mason whose work had been underground. They had all been exposed, therefore, to

both coal dust and rock dust. In the strata of this coal-field sandstones and ironstones are found. The sandstones contain high proportions of silica. The average age of the men was 53. The youngest was 45 and the eldest 63. It is therefore probable that the length of service underground in all cases exceeded 30 years.

"Curious bodies" were found in five cases. They were present in very great numbers in one case, and were easily demonstrated in the lung sections. This patient had died of silicosis and tuberculosis, and had typical whorled fibrosis of his lungs. All the other lungs of this positive group showed various degrees of diffuse fibrosis, which was accompanied in one case by early nodulation. Doubly refractile particles were seen in the sections of three lungs. The histological findings in the 11 negative lungs were very similar to those of the positive group. Diffuse fibrosis, varying greatly in degree, was present in 10 lungs. In one case early nodulation was seen. There were doubly refractile particles in six sections.

Coal-trimmers' lungs.—Seven trimmers' lungs were examined. These men had trimmed coal at the Cardiff docks. Their average age was also 53, so that one can presume that their length of service was the same as the miners'. As far as could be ascertained, six of these men had been coal-trimmers for the whole of their industrial lives. One, however, had been a miner for five years before becoming a trimmer, at which occupation he had worked for 30 years. With the exception of this man, the trimmers had been exposed, presumably, to coal dust alone. Coal which is loaded and trimmed for export is usually "washed" free of extraneous dusts before it is delivered to the dockside.

"Curious bodies" were found in two cases. In one case they were even more numerous than in the miner who died of silicosis. They were abundant in the histological sections, lying among the coal dust deposits and in areas of fibrosis. In the other the "bodies" were few but were quite typical. Both these lungs showed almost no fibrosis. Two of the negative trimmers' lungs showed much diffuse fibrosis. Both men had died after a long period of dyspnœa and had been bedridden for many months before death. There was no evidence of active tuberculosis in either case. In one of these cases portions of lung were submitted to chemical analysis. In two blocks of lung, selected as specially hard and black, 11·9 per cent. and 4·8 per cent. of silica was found in the ash. There was practically no fibrosis in the sections from the other three negative cases. Although large deposits of coal dust in peribronchial and perivascular lymphatics were a feature of all the trimmers' sections, doubly refractile particles were not seen in any instance.

"*Control*" *lungs.*—Two of the three control lungs gave negative results. In the third, the lungs of a young woman, one "curious body" resembling, though possibly not identical with, those found in the coal-workers' lungs was seen after examining several slides. The lung debris contained many spicules which appeared to be mineral dust. There was no trace of fibrosis in the lung sections, but there were small deposits of coal dust, such as one would expect to find in the lungs of a woman who had lived in a narrow colliery valley where the atmosphere is laden with dust from the coal screens.

DISCUSSION

In this paper the term "silico-anthracosis bodies" has been avoided because it appears to me that no connexion with silico-anthracosis as a disease has been established. From the data reviewed here it appears that the presence or absence of "curious bodies" is of no help in establishing a diagnosis of the disease. It is true that a large number of "curious bodies" were present in the lungs of the only miner who died of silicosis. They were, however, still more numerous in the case of the coal-trimmer whose lungs showed practically no fibrosis. There was a marked degree of fibrosis and a large amount of dust in the lungs of two other trimmers, yet no "curious bodies" were found in these cases even after repeated examinations. It is difficult to assign significance to these "bodies" until more is known of their structure.

In this series of coal-workers were trimmers who had been exposed exclusively to coal dust and miners who had worked in coal and rock mixtures. "Curious bodies" were found in both groups. There was nothing to suggest from the mere finding of the bodies that one of these dusts was responsible for their formation. They were found in lungs which showed much fibrosis and in lungs where there was none; in miners' lung sections where doubly refractile particles were present and in trimmers' lungs where no bi-refringent particles were seen. It has been suggested that these "curious bodies" are formed by the adsorption of disintegrated blood substances by spicules of silica or particles of carbon. Another view is that they are due to the chemical interaction of an iron-containing mineral with the tissue fluids.

So far it has been impossible to obtain the "curious bodies" in sufficient numbers to investigate them minutely. It would be useful to identify the spicule by a petrological method such as measuring its refractive index. The deposit at the poles of the body may be a manifestation of some type of "crystal growth" such as is often seen in some siliceous minerals.[5] Quite often the deposit is arranged in a radiating fashion which suggests a phenomenon of this kind. Whatever may be the constitution of the "curious body" it appears that a gross pathological condition of the lungs is not necessarily present in cases where they are found.

SUMMARY

Portions of lung from 26 cases were digested with trypsin and the deposit examined microscopically. "Curious bodies" were found in eight cases. They were found in lungs from five of 16 miners, two of 7 trimmers, and one of 3 controls. From evidence collected in this investigation, it appears that gross pathological lesions of the lungs need not be present where "curious bodies" are found, hence it is difficult to ascribe any significance to their presence.

I am greatly indebted to Prof. S. Lyle Cummins for his help and encouragement during this investigation, to Prof. Duguid for the autopsy material and for allowing the microphotographs to be made in his department. A grant from the Medical Research Council greatly facilitated the research.

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CLINICAL AND LABORATORY NOTES

THE NATURE OF HENRY'S REACTION IN MALARIA

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In 1928 A. F. X. Henry described a new serological test for the diagnosis of malaria, depending on the property of malarial serum to flocculate a solution of melanin pigment. This he called melano-flocculation. The nature of this reaction has still to be determined. Although various suggestions have been put forward no satisfactory explanation has been given.

Henry (1934) favours the view that the reaction occurs as the result of interaction between melanin pigment acting as "antigen" and a corresponding antimelanin-agglutinin developed in human sera after malarial infection. Chorine and Gillier (1933), however, have suggested that the reaction is due to an increase in the serum globulins accompanied by a disequilibrium in the other soluble constituents of the serum. They have shown that negative sera can be transformed to positive sera by the addition of four volumes of 1/2000 formalised distilled water, that positive sera become negative when heated at 55° C. for half an hour, and that the melanin pigment used for the test proved to be non-antigenic by animal immunisation.

Greig, van Rooyen, and Hendry (1934) favour the latter view, since by a number of experiments they found the reacting principle in positive serum to be thermolabile at the relatively low temperature of 55° C., and that melanin pigment failed to produce an agglutinin response after repeated inoculation in rabbits. Consequently they consider that the phenomenon cannot be regarded as a true flocculation following interaction between antigen and antibody and suggest the term melano-precipitation is more correct than melano-flocculation. They also refuted the idea that the reaction might be due to some other substance or substances which happen to be present in colloidal solutions obtained from hair in the preparation of the solution used, by demonstrating that dioxyphenylalanine, the natural precursor of melanin, also gives a positive reaction.

Chorine and Gillier (1933) have further suggested that the reaction is due in part or in whole to an increase in the blood of such substances as lecithin, cholesterol, and uric acid, but it has been shown by Fairley and Bromfield that in malaria there is, if any change, a hypocholesterolæmia and a slight increase in the blood-urea. Thus the reaction cannot be considered as due to an increase of cholesterol, and it still remains to be proved that the increase of blood-urea is in any way related to the cause of the reaction. Greig, van Rooyen, and Hendry have come to the conclusion that phospholipoids are intimately bound up with the melano-precipitation reaction, and have published graphs to show how any rise in the titre is accompanied simultaneously with a fall in the lipoid phosphorus and vice versa, at the same time proving that the reaction is not due to an increase in lecithins.

Recently I have been investigating the value of the melano-precipitation test in cases of malaria, following strictly the improved technique introduced by Greig, van Rooyen, and Hendry. While the investigation was in progress it was noticed in estimating blood-urea that when 0·2 c.cm. of serum were added to 2·0 c.cm. of distilled water precipitation frequently occurred. A mental note was made of the degree of turbidity produced, and this was later found to correspond with the reaction obtained in the melano-precipitation tests. Consequently it was decided to run a parallel series of controls containing serum and distilled water only, the melanin solution being excluded, and it has been found that under these conditions exactly similar precipitates are found, except that the precipitate in the controls is white while that in the original tubes is brownish in colour owing to the presence of the melanin solution. In fact, on occasions the reaction in the water control has been positive in higher titre than in the melanin tubes; further, in one or two instances where cases have had parasites in the blood, the melanin tubes have been negative while the water controls have been quite strongly positive. Finally, so far in the investigation, every case which has given a positive result in the melanin tubes has done so in the controls with distilled water. These facts are exemplified by the accompanying Table of cases selected from the series.

Case No.	Parasites.	M.P.R.	Titre.	W.C.	Titre.	Remarks.
1	B.T.	+	1/16	+	1/32	—
2	B.T.	+	1/32	+	1/64	W.R. + +
3	B.T.	—	—	+	1/8	—
4	B.T.	+	1/16	+	1/128	—
5	B.T.	—	—	—	—	—
6	B.T.	—	—	+	1/8	—
7	S.T.	+	1/16	+	1/8	—
8	S.T.	—	—	+	1/128	Saline control also negative.
9	S.T.	+	1/4	+	1/128	—
10	Nil	—	—	—	—	Blackwater fever. Rigor 105°.
11	Nil	—	—	+	1/16	Chronic malaria. After treatment with atebrin M.P.R. —ve. W.C. 1/128.
12	Nil	—	—	+	1/8	Chronic malaria. Last rigor nine days before admission.
13	Nil	—	—	+	1/32	M.T. malaria when in S. Africa and in Ceylon. Returned to England 4½ years ago.

M.P.R.—Melano-precipitation reaction; W.C.—water control; B.T.—benign tertian; S.T.—subtertian; M.T.—malignant tertian.

On further reviewing what has been written on Henry's test it was discovered that previous workers, employing the original technique, had already noted that the reaction sometimes occurred with distilled water alone. This flocculation with serum and distilled water Henry calls "surflocculance." Trensz (1932[a]) considered the difference between this and the flocculation in the melanin tubes to be a matter of degree only, Henry's reagent assisting the flocculation. He injected 11 guinea-pigs with trypanosomes (*T. berberum*) and the reaction became positive soon after the appearance of trypanosomes, and as the reaction became stronger "surflocculance" occurred in six of the control tubes. Chorine (1933), on the other hand, does not agree with Trensz that they are the same phenomenon. From observations in the present preliminary investigation I have formed the opinion that these phenomena are one and the same, the melanin merely adding a brown colour to the flocculation; and it appears that the reagent tends if anything to hinder the reaction, but whether it does so as a result of its pH factor, chloride, or other salt content has not been determined. In this connexion it is interesting to note that in Case 8 where parasites were present in the blood the melanin tubes were negative, the water controls were positive 1/128, and when the serum was put up with normal saline only a negative result was obtained. This suggests that the salt content of the solution in itself

tends to inhibit the reaction. Thus, while we are at a loss to account for the true nature of the reaction, it would appear from the observations here made that the precipitate is in all probability a globulin. Furthermore, the pigment produced in malaria has been identified as hæmozoin (Wats and White, 1932) and so it is difficult to understand why melanin should have anything to do with the reaction. In view of these findings it is considered that the melanin employed in the test since its inception plays no real part in the reaction and since it is difficult to prepare could be abandoned. Finally, the terms melano-flocculation and melano-precipitation would appear to be misnomers.

The investigation has been carried out in the Hospital for Tropical Diseases, London. I am grateful to Dr. G. Carmichael Low, Dr. Philip Manson-Bahr, and Dr. N. Hamilton Fairley for permission to use their cases, to Mr. R. J. Bromfield for valuable aid in the laboratory, and I am deeply indebted to Lieut.-Colonel E. D. W. Greig, Dr. C. E. van Rooyen, and Mr. E. B. Hendry, of Edinburgh University and Edinburgh Royal Infirmary, for so kindly furnishing all the melanin solution used in the tests, and to Dr. van Rooyen for demonstrating the test to me.

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CARCINOMA OF THE ŒSOPHAGUS WITH FISTULA INTO THE AIR-PASSAGES

BY W. G. SCOTT-BROWN, M.D. Camb., F.R.C.S. Eng.

ASSISTANT SURGEON TO THE EAR, NOSE, AND THROAT DEPARTMENT, ROYAL FREE HOSPITAL, AND CENTRAL LONDON EAR, NOSE, AND THROAT HOSPITAL

A MAN, aged 59, was first seen on Oct. 16th, 1933, complaining of difficulty in swallowing. Eight months previously he had felt "the throat getting fuller" and for the past three months it had become difficult to swallow; he developed a cough and there was regurgitation of food with coughing, in attacks which were often severe during and immediately after a meal. He described himself as otherwise "as fit as ever," and, being a professional tramp, had walked 20 miles a day for some previous days.

On examination of the nose, throat, and larynx nothing abnormal was discovered except some frothy mucus in both pyriform fossæ. Cervical and axillary glands were not palpable. At the X ray examination by Mr. Ulysses Williams the thin barium emulsion produced a spasm of coughing, and during deglutition it was difficult to follow the barium on the screen. Immediately afterwards it was seen that the barium was passing through a fistula just below the cricoid and that the bronchial tree was clearly outlined (see Figure).

Œsophagoscopy revealed a large ulcer extending across the anterior wall of the œsophagus with the upper edge situated 1½ in. below the cricoid cartilage. The surrounding œsophageal wall was infiltrated and a small piece of tissue was taken from the edge of the ulcer for section. Bronchoscopy revealed a swelling on the posterior tracheal wall about 2-2½ in. below the cords. The posterior wall could not be seen completely beyond the swelling, but a dimple was visible with a drop of blood-stained fluid by it. A section of the edge of the ulcer confirmed a diagnosis of carcinoma of the œsophagus.

Radiogram taken after the patient had swallowed barium emulsion. It has passed through the fistula and into the bronchial tree on both sides.

A gastrostomy was performed by Mr. L. E. C. Norbury on Nov. 8th, and the patient declared himself, and appeared, fit when he was transferred to a L.C.C. hospital on Nov. 22nd. The cough was very much improved. He lived for four months after the diagnosis was first made, and was free from any cough or regurgitation, and indeed of any symptoms referable to his respiratory or alimentary tract. During these four months he became increasingly cachectic and gradually went downhill and died on Feb. 19th, 1934. A post-mortem examination could not be obtained.

There were found to be three other similar cases in the hospital records for the past ten years, and a summary of the case notes is given below. There are one or two interesting points. It will be observed that they were all diagnosed by X ray examinations, though on careful questioning a history could be obtained from them which indicates the presence of a fistula in addition to the œsophageal obstruction. In two cases it appeared that some of the food swallowed was regurgitated with coughing. In another there was a history of being frightened to swallow. The fourth merely complained of a cough which produced a great deal of sputum and that this had had a definite and marked commencement unassociated with any illness.

CASE 2.—Male, aged 59. Admitted Oct. 18th, 1926. Three months ago: lump in throat, difficulty in swallowing. Two months ago: pain on swallowing. Five weeks ago: vomits and coughs after meals; wasting rapidly. Cough for one year, much worse last three months. On radiography barium emulsion runs down to the level of the bifurcation, where there is a distinct check. Then some emulsion passes on into the lower part of the œsophagus and stomach, but a large quantity is seen passing into each bronchus. There is a stricture of the œsophagus at the level of the bifurcation of the trachea due to a neoplasm. Also broncho-œsophagoscopy shows a fistula. No treatment was carried out, and the patient died in St. Luke's Hospital on Nov. 27th, 1926.

CASE 3.—Female, aged 46. Admitted July 10th, 1927. Eleven months ago: hoarseness and difficulty in swallowing. Six months ago: worse. For past two to three months: wasted rapidly and "any food taken" was coughed back again. Radiography (Oct. 5th): post-

cricoid growth, fistula between trachea and œsophagus; bronchi outlined by barium emulsion. Oct. 11th: gastrostomy. Oct. 13th: died.

CASE 4.—Male, aged 65. Admitted August 5th, 1930. Six weeks ago: first symptoms of difficulty in swallowing solids. Two weeks ago: cough and sputum—no pain on swallowing, but frightened to swallow owing to choking. Radiography (lipiodol): extensive obstruction half-way down œsophagus with ? fistula communication into left bronchus. Broncho-pneumonia left lower lobe. Gastrostomy was performed on August 8th, and the patient died on the 10th. At autopsy the œsophagus showed an ulcerated growth at the level of the bifurcation of the trachea communicating with left bronchus. There was broncho-pneumonia of the left lung.

In any case of carcinoma of the œsophagus in which "cough," "sputum," and "bronchitis" are prominent symptoms, and particularly when these symptoms are aggravated by taking food, a fistula should be suspected. The apparent good health of the patient will be misleading, so long as it is generally thought (and the statement still appears in many text-books) that such a perforation is associated with a rapid onset of broncho-pneumonia and death.

It is seen from these cases that the fistula had probably existed for from two weeks to three months before the patient reported to hospital. In Case 2 the patient lived for five weeks after the diagnosis was definitely made, having probably perforated five weeks previously. There was no treatment. In the first case here reported the patient lived for four months after the diagnosis was made, a gastrostomy having been performed, but there seems little doubt that the fistula was present for seven months in all before the patient's death.

BACILLARY DYSENTERY DUE TO FLEXNER, TYPE "Z"

PRESENTING SOME UNUSUAL FEATURES

BY S. D. MCCLEAN, M.R.C.S. Eng.
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FRANK MARSH, M.D. Lond., D.T.M. & H. Eng.
PATHOLOGIST TO THE COMPANY

THE patient was admitted to hospital at Masjid-i-Sulaiman under one of us (S. D. M.) with diarrhœa and pyrexia of 12 days' duration. The attack began with mild shivering and tenesmus; later there was abdominal discomfort and vomiting, and then diarrhœa. The temperature rose to 101° F. The diarrhœa gradually increased in intensity until she was passing some 12 or more stools a day. At no time did she notice blood or mucus in her motions. She continued to have loose motions until admission, with occasional bouts of mild abdominal pain and discomfort, which were associated with mild pyrexia and marked anorexia. About two days before admission she developed mild gingivitis with two aphthous ulcers on the upper gums between the incisor teeth. Her menstrual periods were regular.

On admission pulse-rate 88, temperature 99·4° F., general condition good, no loss of weight, tongue furred, marked generalised hyperæmia of gums, two ulcers on upper gums. Some injection of throat, tonsils not enlarged. No abnormal signs in chest. No enlargement or abnormal signs in heart; pulse rapid, well-marked sinus arrhythmia. Abdomen: generalised discomfort, no marked tenderness at any one place but diffuse slight tenderness. Sigmoid flexure palpable and slightly thickened. Stools only two der day.

Treatment.—At first she was given Bovril, strained soup, weak Horlick's and weak milk and soda, with sodium sulphate grs. 10 four-hourly. On the following day the sodium sulphate was increased to grs. 20 four-hourly; her temperature rose to 98·8° in the afternoon but she had no pain or discomfort. Next day she felt much better; and on the next her diet was increased to fish, eggs, and milk puddings, and the sodium sulphate was reduced. Next day there was considerable improvement and a soft normal-looking stool. She was given a diet scheme and discharged from hospital to have the vaccine in out-patients.

Pathological Investigations.—The patient's blood was examined for malarial parasites with negative results. A differential count showed: polymorphonuclears 50 per cent., lymphocytes 35 per cent., eosinophils 2 per cent., large mononuclears 3 per cent., no abnormal red cells. The urine was negative. The first stool examined was green, watery, and contained a little mucus and *Entamœba coli*. There were no pus, blood, or epithelial cells, no *Entamœba histolytica* or cysts, no ova. Cultured on McConkey's medium, about 12 pearly-white, irregularly margined colonies were seen, 1 mm. across at their broadest point and centrally clear—not granular. Three were picked off and produced acid but no gas, in the butt only, of three tubes of Russell's triple sugar medium. Taken further, acid, no gas, was produced in glucose, and mannite broth; there was slight indol production in peptone broth; motility was absent; gelatin not liquefied, and there was no change in litmus milk. A 24-hour broth culture put up with Burroughs and Wellcome's anti-B. Flexner serum, No. B.6921.M., titre 1/1600 and incubated four hours, half immersed, in a water bath at 56° C. in Dreyer tubes, was agglutinated at 1/100 but not in the higher dilutions. Later 24-hour broth cultures were put up with Medical Research Council standard agglutinating sera, as under:—

Dilution ..	1/25.	1/50.	1/125.	1/250.	Control.
Type V ..	0	0	0	0	0
,, W ..	0	0	0	0	0
,, X ..	T	T	T	0	0
,, Y ..	T	T	S	0	0
,, Z ..	T	T	T	S	0

Explanation of symbol: T = total; S = standard; tr = trace.

The incubation was for four hours at 56° C. in Dreyer tubes; the titre of the sera was 1/250 and they were dated Oct. 3rd, 1933.

The patient's serum was put up with Medical Research Council standard agglutinable cultures, with the same technique as for the standard sera, the results being:—

Dilution ..	1/25.	1/50.	1/125.	1/250.	Control.
Type V ..	S	tr	0	0	0
,, W ..	0	0	0	0	0
,, X ..	T	T	0	0	0
,, Y ..	T	T	tr	0	0
,, Z ..	T	T	S	0	0
Mrs. W ..	T	T	T	0	0

It was considered unnecessary to proceed with absorption agglutination experiments; it seemed quite definite that the type "Z" antigen was the predominant one in the bacillus.

Successive stools for about ten days were cultured on McConkey; the number of non-lactose-fermenters on the plates progressively declined during the first three days and then disappeared altogether, the remaining seven stools all being negative.

An autogenous vaccine was made and the patient was treated with a full course in order to prevent a relapse. A remarkable feature of this illness was the consistently diarrhœic stool; at no time was the classic picture of blood, pus, mucus, and epithelial cells presented by the stools. Another point was the ease with which dysentery bacilli were isolated from

the motions, in comparison with the difficulty of growing the responsible micro-organisms from a typical mass of "pink jelly" of which the great majority of stools from cases of bacillary dysentery are composed. It is possible that the masses of mucus, in these classic examples, actually have an anti-bacterial effect, as demonstrated recently by Prof. Howard Florey, and the result is that the pathogenic organisms are so affected that they are unable to proliferate on a McConkey plate.

We have to thank Dr. E. Jamieson, chief medical officer, Anglo-Persian Oil Co., Ltd., for permission to publish this paper.

REVIEWS AND NOTICES OF BOOKS

Industrial Maladies

By Sir THOMAS LEGGE, C.B.E., M.D. Oxon., D.P.H. Camb., late H.M. Senior Medical Inspector of Factories and Medical Adviser to the Trades Union Congress. London: Humphrey Milford, Oxford University Press. 1934. Pp. 234. 12s. 6d.

IT was in 1898 that Legge was appointed first medical inspector of factories. In the early part of his career at the Home Office he was chiefly engaged in studying and dealing with the prevention of occupational lead poisoning—and with this disease his name will always be associated. He subsequently worked on anthrax, tetanus, industrial cancer of the skin, toxic jaundice, and poisoning by arsenic, phosphorus, mercury, and the bichromates. It is difficult to find an industrial disease on which he could not speak with authority and experience. He resigned his Home Office appointment in 1926, but was afforded an opportunity of continuing to some extent his life's work when he was made medical adviser to the Trades Union Congress in 1929. Lady Legge explains in the dedication to the book that the author, knowing that his death might befall before the book was ready for press, left directions that Dr. S. A. Henry of the Home Office should be asked to edit it, and this has been arranged.

The first two chapters deal with notification of industrial disease and industrial poisoning and compensation for industrial diseases. The history of the subject is revealed, and the four axioms for which Legge is now well known are laid down:

(1) Unless and until the employer has done everything—and everything means a good deal—the workman can do next to nothing to protect himself, although he is naturally willing enough to do his share.

(2) If you can bring an influence to bear external to the workman (i.e., one over which he can exercise no control) you will be successful; and if you cannot or do not, you will never be wholly successful.

(3) Practically all industrial lead poisoning is due to the inhalation of dust and fumes; and if you stop their inhalation you will stop the poisoning.

(4) All workmen should be told something of the danger of the material with which they come into contact, and not be left to find it out for themselves—sometimes at the cost of their lives.

Subsequent chapters deal with anthrax, tetanus, and poisoning by lead, phosphorus, mercury, and arsenic. Details are given of industrial processes and methods used in minimising the risks of poisoning. Figures are constantly quoted in tabular form, showing the effects of legislation in reducing the case-incidence from year to year. The subject matter is quite up to date, extensive references being given to new work, such as that of the Harvard workers on lead poisoning, of the Queensland workers on chronic nephritis amongst young people, and of geologists on sericite in quartz. Poisoning by benzene, nitro compounds, carbon bisulphide, carbon tetrachloride, dinitrophenol, and methyl alcohol follow. Separate chapters are devoted to poisoning by fumes and gases, industrial dermatitis, industrial cancer of the skin, and industrial pneumonoconiosis. Tables and figures of the incidence of the various types of poisoning are provided throughout the book, and emphasis is everywhere placed upon the type of protective measure found effective in the industrial process concerned.

In one respect the book could be improved, and that is the choice of illustrations. The pictures of industrial cancer are excellent and to the point, but industrial argyria is profusely illustrated though it has quite disappeared in industry. The picture of the dust cloud from stripping the cylinder of a cotton carding engine suggests that a spinning mule, a grinding shop, and radiograms of the chest in pneumonoconiosis could usefully be added. Illustrations of the methods used in preventing disease in industry would be more instructive to the student than tables and charts showing the incidence of industrial disease at various times, and we should like to see pictures of exhaust ventilation applied in a lead works, of a rock-drill provided with a water-jet, and of a vacuum apparatus in use to clean a carding machine in an asbestos works.

This is a book which should be in the hands of every medical man engaged in the health inspection of factory workers, but it is also a book for the general practitioner, by whom most cases are first seen, and who should have sufficient knowledge of industrial conditions to understand how his patients may become ill as a result of the occupation they follow. To-day 37 occupational diseases are scheduled as compensatable by various Acts of Parliament.

The work is a monument to a man who was not only a pioneer in the prevention of disease in industry, but who was probably the greatest authority on this subject of our times.

Die Postoperativen Pneumopathien

By Prof. C. HENSCHEN. Basel: Benno Schwabe and Co. 1934. Pp. 177. Fr.8 (Swiss).

THIS monograph is in the main a survey of the world's literature on post-operative pulmonary complications. Statistics from the well-known surgical clinic in Basle, and short accounts of the author's views, experiments, and practice are interspersed, but no concise statement of essentials emerges. A vast number of writings have been abstracted, condensed, arranged, and to a certain extent discussed, with painstaking care and thoroughness; the gist of them all is there for the inquirer to consult and judge. It is an excellent example of the agglomerative review. But in this subject, as in many others, most readers would be grateful for that rarer species, the synthetic review, a coherent presentation of what, in the reviewer's judgment, and in the light of his experience, is most valuable in the writings of his predecessors. This monograph will be very useful to the specialist making an intensive study of the subject, but the surgeon or the anæsthetist seeking help in the reduction of post-operative morbidity will have difficulty in seeing the wood for the trees.

Nature and Nurture

By LANCELOT HOGBEN, M.A., D.Sc., Professor of Biology in the University of London. London: Williams and Norgate Ltd. Pp. 143. 6s. 6d.

THIS book consists of the William Withering memorial lectures delivered at Birmingham last year under the title of "The Methods of Clinical Genetics." It contains little that the author has not previously discussed in his book "Genetic Principles in Medicine and Social Science"; but the essential arguments are here presented in simpler language and are less burdened with higher mathematics. Since his appointment to the chair of social biology in the University of London, Prof. Hogben has in two main ways contributed to the study of how genetic principles might be applied towards the prevention of disease. In the first place, he has drawn attention to the fact that, if adequate statistics could be collected of the familial incidence of certain commoner diseases and defects and of the occurrence of consanguineous marriages among the ancestors of sufferers from them, it might be found that many more than are at present recognised are the product of recessive genes. His influence in stimulating research in this subject is now making itself felt in appropriate quarters.

In the second place, Prof. Hogben's attitude to clinical genetics is avowedly influenced by his dislike of eugenists. In an earlier book he went so far as to advocate the substitution of the term "genetic therapy" for the word "eugenics" on the ground that "the term 'eugenics' has become identified with ancestor worship, anti-semitism, colour prejudice, anti-feminism, snobbery and obstruction to educational progress." Discussing in this book the ambiguities of the word "intelligence" he says, "Dean Inge may describe a social policy as intelligent. In that case, the writer would probably describe it as unintelligent." Now eugenists stress the importance of the rôle of heredity in the causation of human excellencies and infirmities. In many instances they doubtless over-stress it, minimising in the process the importance of the environment. One of the tasks which Prof. Hogben has set himself in this book is to emphasise the possible rôle of the environment. He points out that certain abnormalities in the fruit fly of unquestionably genetic origin, which affect the shape of the abdomen and the number of facets in the eye, largely depend for their appearance on environmental conditions such as moisture and temperature. Unlike the fruit fly, however, human beings begin their lives in an intimate environment, the vicissitudes of which may easily affect them—namely, the uterus. As an example of the possible effects of an abnormal uterine environment, he selects mongolian idiocy—not an entirely happy choice. The genetical statistician, Prof. R. A. Fisher, is especially singled out for attack: working in the rarefied atmosphere of higher mathematics, he is held capable of ignoring completely such trivialities as imperfections of diagnosis and unsuspected defects of environment. The general conclusion is that hereditary human abnormalities are very interesting to investigate, but that our efforts to eliminate them by genetic methods are premature in that we may at any moment learn how to cure them by bringing about changes in the environment. Prof. Hogben quotes Ostwald: "Among scientific articles there are to be found not a few wherein the logic and mathematics are faultless but which are, for all that, worthless because the assumptions and hypotheses upon which the faultless logic and mathematics rest do not conform to actuality."

The combined effect of these two attitudes of the author is somewhat disconcerting. If this book happened to be read by a busy house physician or hospital registrar who had been asked (for no remuneration) to undertake a comprehensive and difficult inquiry into the incidence of consanguineous marriages in the ancestors of all patients suffering from (say) acute nephritis, he might be pardoned for asking what purpose was to be served if the chief promoter of the inquiry regarded it, from the preventive standpoint largely, from the therapeutic standpoint wholly, academic. The answer that the results would be genetically interesting would hardly seem to justify his labours.

A Synopsis of Hygiene

Fourth edition. By W. W. JAMESON, M.A., M.D., F.R.C.P., D.P.H., of the Middle Temple, Barrister-at-Law, Professor of Public Health, London University, and Director of Public Health Division, London School of Hygiene and Tropical Medicine; and G. S. PARKINSON, M.R.C.S., D.P.H., Lieut.-Colonel R.A.M.C. (ret.), Assistant Director of Public Health Division, London School of Hygiene and Tropical Medicine. London: J. and A. Churchill. 1934. Pp. 619. 21s.

THIS standard text-book on public health appears in a somewhat changed form. While retaining its attractive features—excellence of style, abundance of references to recent writings, adequacy of treatment—the order in which the various subjects are treated has been totally changed. Thus ventilation, heating, lighting, atmospheric pollution, water-supplies, sewage, housing, sanitary law—matters which form the special province of the sanitary inspector—although fully dealt with are relegated to the end of the book. Public health administration and vital statistics are presented to the student in the first chapter, the latter being particularly well handled. There is much to be said for the rearrangement; the bias in public health has moved away from environmental hygiene and writers of text-books should take cognisance of the fact. The prevention of disease cannot be discussed without reference to statistics.

The book is thoroughly reliable, and gives to each aspect of the various subjects just the right amount of emphasis. We can recommend it without reservation.

A Short History of Some Common Diseases

Edited by W. R. BETT, M.R.C.S., L.R.C.P. London: Humphrey Milford, Oxford University Press. 1934. Pp. 211. 10s. 6d.

THIS small book contains a series of essays by well-known writers, who have attempted, some with greater success than others, to summarise in a few pages the history of common and prominent diseases. The articles are not written in accordance with any definite pattern, the authors sometimes confining themselves chiefly to a record, with dates, of particular work done by prominent men, while other writers pay particular attention to ancient history, and others to modifications and developments of treatment. As certain of the chapters have very full references to the authorities upon which the writers are relying, the book will serve as a guide to deeper reading. Some of the essays appear scrappy, and all sixteen are not of equal merit, but it is clear that

to tell the story in a few pages of (say) tuberculosis, venereal diseases, endocrine disorders, and heart disease is a difficult task and for the most part the authors may be congratulated on their efforts.

The Atom

By JOHN TUTIN, D.Sc. (Durham). London: Longmans, Green and Co. 1934. 6s.

In this book of little more than 100 pages the author challenges acceptance of the Rutherford-Bohr atomic model. We do not think that the challenge is as serious as it is sincere, for the simple reason that there is very little quantitative backing for the claims that are made for this new atom. Briefly, the author seeks to turn the Rutherford-Bohr atom inside out. Instead of the mass being concentrated about its centre as a nucleus, rather is it collected on the periphery, and he then goes on to explain how many phenomena would, in his opinion, receive a much more rational explanation from his model than from the one which has such general scientific acceptance to-day. It may be that, in stating his claims, the author is confusing the rôle of the atom with that of the molecule. One of the essential duties of an atomic model is to provide a rational mechanism for the emission of radiation, and year by year the spectroscopists become more and more impressed with the potentialities of the Rutherford-Bohr atom in this respect. It would be idle to put forward as a competitor an atom which can do none of these things, whatever other phenomena the new model may explain.

British Journal of Children's Diseases

THE July-September issue (Vol. XXXI.) contains the following papers. The Story of Tracheotomy, by Dr. E. W. Goodall, brings up to date the history of this operation. Dr. Goodall has collected 28 examples of successful tracheotomy during the period of 2000 years up to the time of Bretonneau, the first having been performed by Asclepiades, who was born in the second century B.C. Apart from three cases recorded by Caron in 1766, Andrée in 1782, and Chevalier in 1814, all the successful operations were on adults. The paper will be continued in a subsequent issue.—In An Analysis of Over Four Thousand Cases of Educational Deafness Studied During the Past Twenty-five Years, Mr. Macleod Yearsley records the results of his experience as consulting aural surgeon to the London County Council. The cases are grouped under the headings of congenital and acquired deafness, the former (with which the present instalment of Mr. Yearsley's study is concerned) being subdivided into hereditary and sporadic cases, and congenital aphasia.—Dr. P. D. Davydoff, of the North Caucasus State Institute for the Protection of Maternity and Childhood, contributes a paper on Helminthiasis in Children, in which he records his experience of the condition in Soviet Russia, where it appears to be unusually prevalent and serious.—In a paper on Nocturnal Enuresis, Dr. C. J. C. Earl discusses the incidence, causation, psychological explanations, and treatment of bed-wetting from his experience at the London Child Guidance Clinic.—Some Pædiatric Eponyms: (VI.) Eustace Smith's Sign is the title of a paper by Dr. W. R. Bett, who gives an intimate sketch of this well-known pædiatrician, illustrated by his portrait and autograph. The abstracts are devoted to cardiovascular diseases.

NEW INVENTIONS

AN ANGLE-PIECE FOR MAGILL ENDO-TRACHEAL TUBES

As Dr. Magill[1] has pointed out, endotracheal anæsthesia by means of a single rubber tube is more satisfactory if there is no leakage of gases between the tube and the glottis, and he recommends packing off the pharynx with gauze to prevent this leakage. When using gas-oxygen-ether anæsthesia for abdominal surgery it is even more important to prevent this leakage, and a number of anæsthetists have found that this can equally well be achieved by passing an endotracheal tube by the nasal route, replacing the facepiece of the gas machine, and securing it on the patient's face with a Clausen's harness. This obviates the necessity for packing, and is a much simpler procedure than is necessitated by passing the inflatable intratracheal cuff of Guedel and Waters.[2] It is a method which can be used for all operations below the level of the mandible, and whose only contra-indications are when there has been bleeding from the nose on intubation or when the pharynx is full of secretions.

There are, however, three objections to the use of any of the existing patterns of angle-piece for this purpose:—

(1) When the facepiece is removed at the end of the anæsthetic a Magill or Challis or Rowbotham pattern angle-piece is often found to have bruised the upper lip or the nose.

(2) There is a tendency for any of these models to touch the sides or cushions of the facepiece and thus obstruct the free airway.

(3) Not infrequently some of the lubricating vaseline works its way between the tube and the angle-piece, and the latter becomes disconnected. In such a case the tube can quite easily slip down the nose, and may have to be recovered with a pair of forceps.

To obviate these difficulties I have devised a small metal funnel, shown in the accompanying photograph, whose narrow end fits into the tube. This end is provided with knocked-up teeth which take a firm grip of the inside of the tube. The middle of the stem is curved at an angle of about 200°, so that it fits the curve of the nasal fossa, while the wide end is rounded off and presents no sharp edges which can bruise the face.

Since this method is chiefly useful in adults I use two sizes of these connexions: the smaller to fit a No. 6 Magill tube, and the larger a No. 9. To ensure an adequate airway the minimum internal bore should never be less than 3/16 in. These end-pieces are large enough to admit of the passage of the cleaning-brush, and are intended to be left in place during cleaning and boiling throughout the "life" of the tube.

This method, as Magill[1] and Tovell[3] have pointed out, is equally useful with a Schimmelbusch mask if open ether is being administered, but the tube is less liable to become obstructed by the gamgee or other face-pads if this type of angle-piece is used. It is made by A. Charles King, of 34, Devonshire-street, W.1.

London Hospital, E. N. A. GILLESPIE, B.M.

[1] Magill, I. W.: Proc. Roy. Soc. Med., 1928, xxii., 83.
[2] Guedel, A. E., and Waters, R. M.: Ann. of Otol., Rhinol., and Laryngol., 1931, xl., 1139.
[3] Tovell, R. M.: Anæsth. and Analges., 1931, x., 97.

THE LANCET

LONDON: SATURDAY, SEPTEMBER 8, 1934

THE WORLD WE LIVE IN

ANY common man who hears or reads Sir JAMES JEANS's presidential address this week to the British Association at Aberdeen may be excused if he feels a little bewildered. Is this, he may well ask, the physicist's most up-to-date summary of the most exact of sciences, or is it Alice in Wonderland, or is it someone in a dark room looking for a black cat which isn't there? Something perhaps of all three, but probably mostly a demonstration of the scientific philosopher at his best, groping about for an explanation of the results of observation and experiment which he knows by revelation to be there but which he cannot clearly grasp, still less define and make available for others. Sir JAMES's address might have been written by a religious mystic who was not quite sure what particular gospel he ought to preach. Theoretical physics, he says, is concerned with appearances rather than reality, and it has two lots of appearances. In the one the world is made up of particles which exist in time and space. In the other it is composed of a system of waves, or perhaps more nearly as a system of waviness for which ordinary space and time provide no adequate background; it may need six dimensions of space, and as there is no justification for identifying any particular three of these with those of ordinary space the wave picture comes to lie entirely outside space and is purely a construction of our minds. Experiment and mathematics are all on the side of the wave structure and yet the particles cannot be abandoned, for they represent the grains or units which pervade the whole of nature from the indivisible quantum of energy to the indivisible live organism.

The physicist's trouble is that no one has yet had the luck or cunning to hit on the idea which will bring together these two interpretations into one and provide an explanation of the universe as a consistent whole. Sir JAMES does not doubt that such a synthesis is possible, but he goes on to point out that it may be expected to come from ourselves rather than from outside. The old physics thought that it was studying something which had an objective existence of its own—and most of us still so think of the world. But the new physics—if indeed it still be physics—holds that the nature we study does not consist so much of something we perceive but of our perceptions. In the old physics the student's mind was a spectator, in the new it is an actor; the perceiver and the perceived are interacting parts of a single system, and no clear distinction can now be drawn between mind and matter. If this is so, and if nature consists of our own mental constructions, how is it that we all make the same constructions and see the same moons and the same mountains? It is not, we think, quite certain that we do; myopes and the colour blind suggest that there may be a good deal more variability than is apparent. But assuming a general uniformity, Sir JAMES proposes an attractive explanation. Physically, he points out, the wave explanation takes no notice of individual particles, and innumerable photons come together as a beam of light, electrons as an electric current, and cells into a live organism.

If this is true of the objects perceived it may be equally valid for the perceiving minds. In space and time we are obviously distinct individuals; beyond these limitations we may be the components of a continuous stream of life. And so once again the mathematician comes round to the biological point of view, and now he is no less of a mystic. But Sir JAMES is no biologist, else surely he would not have repeated Sir JAMES EWING'S gloomy misconception, emitted at the Yale meeting two years ago, that man's control over nature has outstripped his moral control over himself. No naturalist could believe that, nor is it consonant with the plain experiences of life, and we could wish that Sir JAMES JEANS had not felt in duty bound to come back to earth at the end of a noble sermon.

TUBERCULOSIS AMONG NURSES

304. The fear of infection is difficult to combat, though reports of infection with tuberculosis of the nursing staff of sanatoriums are so rare as to be negligible. Since tuberculosis is notifiable, statistics bearing on this aspect of recruitment should not be difficult to collect, and their publication might help to convince parents that their daughters are no more liable to contract tuberculosis than they would be in any other branch of nursing.

This paragraph from the final report (1932) of THE LANCET Commission on Nursing deals quite frankly with a matter of public interest. The risk of infection taken by nurses whose duties bring them into contact with tuberculous patients must always exercise the minds of those responsible for training. So far however no very clear leading as to the prevalence of the infection has been forthcoming. Dr. J. A. MYERS, Dr. H. S. DIEHL, and Dr. H. D. LEES[1] have recently explored the question from a new angle by comparing three nursing schools in the United States, one having a tuberculosis service of 30 beds amongst its nursing duties, the others having tuberculous patients to nurse from time to time but having no definite tuberculosis service. Judged by the standard of tuberculin tests of probationers followed through to their final year of training, school 1 with the nursing service comes off very badly. The positive reactors in this school

[1] Jour. Amer. Med. Assoc., June 12th, p. 2086.

increased from 40 to 100 per cent., whereas in school 2 the reactors remained more or less stationary and in school 3 only increased from 25 to 45 per cent. The authors have no doubts as to the significance of these positive reactions. They say "the hospitals that have infected for the first time or reinfected their students [i.e., nurses] have committed a serious offense against them. A good many of these girls will suffer from clinical tuberculosis as the decades pass, and some of them will die from that disease." This is hard hitting, but the authors support their views with the fact that more than 11 per cent. of the nurses starting negative to tuberculin in 1929 are already suffering from clinical disease. At the same time this particular school is perhaps not to be regarded as typical but rather to be held up as a warning to thoughtless administrators. J. HEIMBECK'S [2] figures for Oslo, so often quoted, show that out of 282 nurses who began their training with a positive Pirquet reaction, 1·4 per cent. subsequently developed tuberculosis, whilst of 299 with a negative reaction 22 per cent. developed the disease.

In dealing with the number of actual breakdowns from tuberculosis amongst nurses we are on safer ground than with the positive reactors. In this country figures were long ago published showing the proportion of resident medical officers, dispensers, nursing staff, female servants, and porters at Brompton and Victoria Park hospitals who contracted tubercle. The results were regarded as highly reassuring, but it must be borne in mind that diagnosis before the discovery of the tubercle bacillus was not very precise. In Germany, following upon CORNET'S work on transmission of bacilli by dust, a hospital inquiry was instituted by the Prussian Minister concerned, with the result that a high mortality amongst the Catholic nursing orders was revealed. In 1910 J. E. SQUIRE, in a paper read before the Royal Society of Medicine, collected the data then available; of 234 nurses who had worked at Ventnor and Crooksbury 3 (or 1·2 per cent.) were then known to have had a breakdown. After the war the subject was approached again, and in a more systematic manner, both in Europe and America. For the six-year period 1918–1923 O. SCHEEL found [3] that among 2913 nurses in Norwegian communal hospitals there were 30 cases of pulmonary tuberculosis (including miliary), 27 of pleurisy, 3 of renal, and 3 of osseous tuberculosis, making a total of 63 (or 2·2 per cent.). In this record the incidence of pleurisy was greatest in the first year of the nurse's service, and of other forms in the third year. One of the most thorough investigations [4] is that of E. L. Ross for Canadian hospitals. A preliminary inquiry had shown in 1928 that out of 1514 women treated in a group of Canadian sanatoria 99 were nurses. Ross compiled a record of 60 tuberculous nurses; he found that 40 had broken down during training and 20 afterwards, 10 of the latter within one year and 5 within three years—that is to say, of 800 nurses trained during a four-year period in the province of Manitoba approximately 6 per cent. became sanatorium patients directly from their training schools or within a year of completing their training. These 60 nurses came from 20 different hospitals; only rarely did a sanatorium nurse break down with tuberculosis. In America J. A. BRITTON and BOLLMAN (quoted by E. K. GEER) found 2·2 per cent. of all nurses employed in Chicago had tuberculosis, S. J. SHIPMAN and E. A. DAVIS 2·6 per cent. in the University of California training school over a period of six years, and GEER himself 5·5 per cent. in St. Paul, Minnesota (but only 1·6 per cent. in a later series). An inquiry in a New Zealand hospital by D. W. CARMALT JONES [5] and a committee of the hospital staff shows an incidence of 3 per cent. per annum during two years, all cases being pulmonary tuberculosis. In Germany H. MUCH (quoted by GEER) found the incidence in the Eppendorf Hospital up to 1918 was 1 per cent.; after the war it rose to 4·6.

As far as we are aware no recent figures are available for this country with the exception of a brief record [6] of nurses under the Welsh National Memorial Association published in 1926—11 tuberculous breakdowns in 996 nurses (1·1 per cent.). It would appear however that the incidence of clinical tuberculosis amongst nurses generally ranges between 1 and 6 per cent. While that may be true—as well as vague—we cannot draw deductions until we know the incidence of tuberculosis amongst the young adult female population in the districts from which probationer nurses are drawn. Very few of the writers on the subject have attempted this; those who have (e.g., CARMALT JONES) suggest that the figures for nurses may not be in excess of their non-nursing similars—in other words, tuberculosis amongst nurses is part of the general problem of the undue prevalence of tuberculosis amongst young adult females. This is the first point for further investigation. Some of the records quoted are compiled for the years of training only, others include follow-up records for various periods after the completion of training. It is obvious that the nurse is exposed to special risks, but the old danger from the diminution of resistance by excessive fatigue is now less frequent, while food and sleeping accommodation are usually better than in former days. Against this must be set the fact that nowadays nurses begin their training early in life. Ross noted that the breakdowns appeared to have no special relationship to any particular part of hospital work, though there was a general impression amongst the nurses themselves that night duty had had an unfavourable effect. Sanatoria have as good a record as general hospitals, indeed, in some cases better; probably because, as Ross pointed out, undiagnosed cases of infective tuberculosis are

[2] Norsk mag. f. laegevidensk., 1929, xc., 18.
[3] Tidsskr. f. d. Norske laegef., 1924, xliv., 709.
[4] Canadian Med. Assoc. Jour., 1930 xxii., 347.
[5] Arch. Internal Med., 1932, xlix., 77; and Amer. Rev. Tuberc., 1934, xxix., 88; Tubercle, 1933, xv., 59.
[6] Tubercle, 1926, vii., 334.

more common in the latter, whilst an open-air régime is the rule in the former. Fortunately, in the case of the nurse early diagnosis is generally assured. Ross noted that as many as 38 of his 60 cases had been diagnosed within two months of developing symptoms, a much better record than that of young adult female patients in general. The prognosis therefore is also better.

The practical issues are various. Two of these are seen in the questions: Should young women with a family history of tuberculosis be accepted as nursing probationers? Should ex-tuberculous patients be offered posts? Some sanatoria are prepared to accept the risk of a further breakdown, whilst general hospitals in most cases definitely decline to take the risk. The presence of obsolete tubercle in nurse applicants who have never had an actual breakdown raises an issue closely related to that of HEIMBECK'S tuberculin-positive nurse. Is it better for a nurse to have a positive tuberculin or a negative reaction on starting training? C. J. JACOBSON [7] in recording 5·2 per cent. of Danish nurses with tuberculosis was unable to satisfy himself on this point. A positive reaction before training generally means obsolescent tubercle; a positive reaction acquired during training is more likely to signify active disease. X ray records should prove more valuable than tuberculin tests in the decision. We shall not get far until many hospitals compile records of their nurses, including a follow-up inquiry, and pool their experience.

THE CAUSATION OF SQUINT

WHAT is the primary cause of concomitant internal squint? DONDERS taught that it is hypermetropia, resulting in a want of balance between the linked reflexes of accommodation and convergence. The theory is sound so far as it goes, and the prescribing of spectacles is, and will doubtless remain, an essential preliminary to treatment in all applicable cases. Many cases, however, occur in emmetropes or quite low hypermetropes and, in general, when an internal squint is associated with hypermetropia the extent of the former by no means shows the correspondence with the degree of the latter that the theory demands. A second well-established cause is a defect in the power of fusing the images which fall upon the retinæ of the two eyes. In 1903 Mr. CLAUD WORTH published an important book in which he maintained that this is the essential condition applicable to all cases. By inventing the amblyoscope he laid the foundation for the modern orthoptic treatment of squint, and though 20 years later at a meeting of the Ophthalmological Society he admitted [8] that the proportion of cases in which fusion training is applicable is much smaller than he at first thought, we may agree with him that in suitable cases and at the right age this treatment yields results which could not have been obtained by any other means. Most of the surgeons who spoke at this meeting agreed about the theoretical value of the amblyoscope, but for practical purposes used it merely as a means of diagnosis. Since then many new instruments have been invented for training the sense of fusion, and some of them are in daily use at the orthoptic training clinics of ophthalmic hospitals. For an estimate of the value of these devices on the one hand, and of the practical limitations of their usefulness on the other, our readers will be grateful to Mr. L. H. SAVIN, whose post-graduate lecture appears at the front of our present issue.

Although it is probably true as maintained by WORTH that all cases of concomitant squint are accompanied by a defective development of the fusion sense, yet it is open to question whether he was correct in maintaining that this is the essential cause in all cases. Speaking at the discussion in 1921, already referred to, Mr. BISHOP HARMAN maintained that the most important determining cause was defective muscle balance. He cited some cases of extreme esophoria continuing into adult life without causing squint, and suggested that the reason why these cases are so rare is that most of them are lost in the all-obscuring condition of manifest squint. Heredity is an important factor in many cases, and examples more or less similar to Mr. SAVIN'S curious case of congenital squint in twins will be within the experience of many ophthalmic surgeons. Finally, as Dr. W. S. INMAN has so often insisted, the psychological element must not be ignored. Squint often varies with the emotional state of the child, especially about the time of onset, and may even disappear spontaneously. Miss M. A. PUGH, who has had considerable experience at the Moorfields clinic for the orthoptic training of squint, has gone into the causation in 500 cases.[9] Of these, refractive error was the primary factor in 62 per cent., defects in the fusion sense in 15 per cent., psychological factors were predominant in 21 per cent., the remaining 2 per cent. being put down to physical defects. Miss PUGH further subdivides the 103 psychological cases thus. Imitative squint 7 per cent.—in one pair of brothers both squinted, the elder one had a large refractive error and the younger one was emmetropic. The younger one squinted a week after the elder one. Jealousy squint 10 per cent.—a frequent cause is the advent of a new baby; the elder child will mope and be unhappy and will suddenly squint. The wish seems to be to bring the focus of attention back to the patient. Fear or shock squint 26 per cent.—as when a child was frightened at night by a drunken father and woke up on the following morning with a marked and constant squint. In these ways nearly half the cases in this group are accounted for. The remainder occurred in children who were either themselves "difficult" or whose home surroundings were unfavourable. It may be doubted whether it is really possible to say what is the primary cause of squint in the great majority of cases, but among the causative factors the psychological cannot safely be neglected.

[7] Hospitalstid., 1933, lxxvi., 763.
[8] Trans. Ophth. Soc., 1921, xli., 181.
[9] Brit. Jour. Ophth., August, 1934, p. 446.

OUR ELDERS AND BETTERS

A LETTER lately appeared in the *Times* suggesting that the medical profession is unduly severe on patients over seventy. The writer, himself a doctor, took the view that after this age response to treatment is poor and habits are already moderate, so that insistence on a strict régime may, to no purpose, make life not worth living. He got scant thanks, however, for this humane thought; one septuagenarian reader sent an answer which implied that he, at all events, is willing to try anything once; and a surgeon was provoked to declare that he had found two classes of patients almost immune from the perils of surgical attack—namely, Quakers and those over 80. The fact is that the old will stand a good deal more than we usually give them credit for. Dr. F. W. BAILEY,[1] of St. Louis, points out that as people tend to lead quieter, and therefore (he considers) more normal, lives as they grow old, they become less subject to such ills of youth as acute appendicitis, ruptured duodenal ulcer, acute pancreatitis, acute cholecystitis, and specific blood-stream infections. On the other hand, they are exposed to greater danger from circulatory and renal changes, enlarged prostate, malignant degeneration, fibrosis, and fatty degeneration, and unfortunately there are plenty of occasions on which acute surgical emergencies are superimposed upon degenerative changes, and timely surgery becomes desirable. As a rule, however, the patient is serenely ready to chance it, like the old lady with acute obstruction whose case is described by Dr. H. C. COLMAN on page 576. The aim, in such a case, is not to rejuvenate the patient but to return him to his normal senile state. "When surgery is necessary in the very aged," Dr. BAILEY says, "prolonged bed rest, sudden change of environment and diet and an abrupt curtailment of previous habits which are not directly inimical to their illness, should be avoided and the maintenance of an agreeable psychic atmosphere encouraged." He thinks that in all serious cases a pre-operative transfusion of blood should be given, or, where that is impossible, intravenous glucose. Serious ailments should never be allowed to develop beyond the margin of safety, and minor ailments should not be left untreated merely because the patient is old. He finds that patients are more grateful, on the whole, for the relief of a minor painful disability than for successful treatment of something more serious. This is worth bearing in mind, for the old have as much right to be comfortable as the young.

If the aged offer few terrors to their surgeon they usually expect to find a good listener in their physician. He can always retaliate, however, by putting the patient on a diet, and that outlined by Dr. ROBERT HUTCHISON in the "old age" number of the *British Journal of Physical Medicine*,[2] though plain to the point of grimness, has probably helped many an antique digestion to work smoothly. He recommends, for breakfast, dry toast and butter, a lightly cooked egg or a little white fish, and one cup of tea or coffee; for the midday meal, two courses only, fish and meat, fish and a sweet, or meat and a sweet—the sweet to be milk pudding, baked custard, junket, or stewed fruit. For tea there is one cupful of weak tea and no solid food; and this is followed by a light evening meal of white fish and a potato, or bread and milk, or a boiled egg, and at bedtime a cup of soup or Benger's food, or a little whisky and water and a biscuit. Happily Dr. HUTCHISON adds that such a scheme must be used with elasticity. In some people "appetite and digestion remain unimpaired up to an advanced age and for such fortunate ones the ordinary diet of a healthy man is permissible though strict moderation should be exercised in its use."

There is no unison, of course, among the oracles in reply to the question: "When does old age set in?" One speaker, discussing Dr. BAILEY'S paper, maintained that a man was old when he gave up tennis and took to golf—a decision which many will contemplate with alarm. Dr. BAILEY puts the limit, with liberal exceptions, at 60, Dr. COLMAN at 70; while Sir HUMPHRY ROLLESTON, in his "Medical Aspects of Old Age," offers evidence in favour of the classical statement that the circulatory system, more often than any other part of the body, sets the upper limit of the human life span. But even the doctrine that a man is as old as his arteries has its pitfalls; the late A. P. GRAVES, the Irish poet, when he was forty visited his doctor, who alarmed him by saying: "Mr. Graves, you have the arteries of a man of eighty." He lived to be nearly a hundred, and somewhere in his eighties had the pleasure of hearing his doctor exclaim: "Mr. Graves, you have the arteries of a man of forty!"

[1] Amer. Jour. Surg., May, 1934, p. 487.

[2] Brit. Jour. Phys. Med., August, 1934. Contributions on various aspects of old age by Mr. F. W. Law, F.R.C.S., Dr. F. Talbot, L.D.S., Dr. Robert Hutchison, Mr. J. C. Ainsworth-Davis, F.R.C.S., Dr. W. Yeoman, and Dr. W. W. MacNaught.

IN MEMORY OF THEODORE WILLIAMS

GENEROUS gifts for the advancement of medicine are made known in the will of the widow of Dr. Charles Theodore Williams, who died in July at the great age of 90 years. Theodore Williams, who was born in 1838 and died in 1912, was a student of Pembroke College, Oxford, and throughout his life remained a devoted son of Oxford. He founded four university and two college scholarships in human anatomy, physiology and pathology, including bacteriology in relation to medicine, and shortly before his death he was elected an honorary fellow of Pembroke. He was also in his lifetime a benefactor of the Royal College of Physicians of London, of which he became fellow in 1871, councillor in 1891, and censor in 1899. He gave £1000 to the endowment fund of the College and was instrumental in founding the Bisset Hawkins memorial medal. He was also for a time president of the Medical Society of London. The bequests now announced include £30,000 to Oxford University, to be expended by the faculty of medicine for the promotion of medical education; £5000 to the Royal College of Physicians, to be devoted to the exercise of hospitality and to the maintenance of its dignity; and £100 to the Medical Society of London. Mrs. Williams has also left to Pembroke College a portrait in oils of her husband, by Herbert Olivier, and the residue of her estate to promote its prosperity.

ANNOTATIONS

AEROPLANES AS CARRIERS OF INFECTIOUS DISEASE

THE temporary failure of international coöperation in politics throws into relief the success of international coöperation in preventive medicine. Its latest achievement is the Sanitary Convention for Aerial Navigation,[1] now signed and ratified by most of the important countries of the world, notable exceptions being the South American republics and the Dutch East Indies. The Convention is comprehensive and adequate and provided that the High Contracting Parties carry out their work properly it should go far to allay the fears of the many hygienists who see great danger of infectious disease being spread by aeroplanes. Of its two parts the first contains some general provisions dealing with the establishment of "sanitary aerodromes" and other matters, while the second sets out regulations governing the "Big Five" diseases—plague, cholera, typhus, small-pox, and (with a special chapter to itself) yellow fever. It is left to the authorities of each country to decide whether "sanitary aerodromes" shall be established, but the attendance of a medical officer at all "authorised" aerodromes where required for the purposes of the Convention is obligatory. Sanitary aerodromes will have a staff of medical officers and sanitary inspectors, a place for medical inspection, equipment for the taking of pathological specimens, facilities for the isolation, transport, and care of the sick and of contacts, and apparatus for disinfection, disinsectisation, and deratisation where required. Aircraft will not be required to carry bills of health but facts of public health importance, which are to include the appearance of any of the Big Five in the area from which the aircraft has come, are to be entered in the journey log-book. Although any territory may if it thinks fit carry out sanitary measures on arrival of aircraft from an infected "local area," it is before departure that the special measures (inspection, disinfection, &c.) enjoined for plague, cholera, typhus, and small-pox must be taken. These follow the same lines as in the International Sanitary Convention of 1926, and it is chiefly in connexion with yellow fever that further stringent provisions are laid down.

The special dangers of yellow fever lie in the wide distribution of its mosquito vector, the highly infective nature of the virus, and the existence of large "silent" areas in which the native population has been infected. One such area was described in our last issue by Dr. T. F. Hewer, who showed that the disease has been or is endemic in a wide zone in the Anglo-Egyptian Sudan where its presence has been unsuspected. As the Imperial Airways route to the Cape runs through this area it is gratifying to learn that all the measures prescribed by the Convention are already in force there. They include a general provision that signatories shall "take the necessary steps to ascertain whether yellow fever exists in their territory in a form which, though not clinically recognisable, might be revealed by biological examination." In regions where yellow fever has occurred or exists in endemic form there shall be established "anti-amaryl aerodromes" which in addition to the equipment of a "sanitary aerodrome" shall be situated at an adequate distance from the nearest inhabited centre and shall have mosquito-proof dwellings and water-supply. Failing the establishment of an anti-amaryl aerodrome all air traffic from such an area shall be suspended. When yellow fever is discovered in a region, the following measures are to be taken as late as possible before the departure of aircraft. (1) The aircraft and cargo will be inspected for mosquitoes and if necessary disinsectised. (2) The passengers and crew will be medically inspected, those who have been exposed to risk of infection being required to remain under observation either at the aerodrome or elsewhere until six days from their exposure. (3) The names of passengers and crew, with all information available about their exposure to infection, will be entered in the log-book. On arrival in a region in which yellow fever is not endemic but might develop, the aircraft and passengers and crew may be inspected and any person who has not completed six days since his last possible exposure to infection may be kept under observation for not more than six days.

These are stringent regulations and may somewhat hamper the development of air transport in the large region of Africa where yellow fever is now known to be endemic. On the other hand, the danger is a very real one[2] and it cannot be suggested that the precautions are excessive. The appearance of yellow fever in a country such as India would be a very serious matter indeed. It is also to be hoped, as Dr. Hewer suggests, that protection by vaccines[3] may soon be so far perfected as to allow of relaxation of the regulations to persons in a hurry. In any case it was well that the Rockefeller Foundation decided to open a special campaign against yellow fever many years before the dangers from air travel were generally recognised, since it is owing to these workers' efforts that the menace of the "silent" endemic areas was discovered. As the late Sir Walter Fletcher wrote[3]: "It is no stretch of fancy to say that the discovery of the true nature of the disease and of its preventability by vaccination may have come just in time to save us from a world disaster of unthinkable magnitude."

MEDICAL EXAMINATIONS IN DUSTY INDUSTRIES

INTEREST attaches to the principles underlying an order[4] made by the Home Secretary which came into force on Sept. 1st. This order deals with the initial examinations of workmen who seek to be employed in occupations with exposure to injurious dust under the silicosis and asbestosis compensation schemes. It amends a previous order[5] by laying down with greater precision the circumstances with which anyone must comply who is seeking employment in the scheduled industries: the refractories, sandstone, pottery, and asbestos. First, in his own interest, the worker is to be refused employment if his physique falls short of certain medical requirements with regard to development and the absence of pulmonary or cardiac disease. Secondly, in the interest of his fellow workers who, by reason of their exposure to the specific occupational dusts, are unduly predisposed to succumb to tuberculous infection, he is to be refused employment if he is suffering from tuberculosis. Precedents are here being set which may with advantage to the individual and to the community be more widely used in the

[1] The text is published by H.M. Stationery Office. London. 1934. 9d.

[2] See THE LANCET, 1929, i., 194; 1933, i., 478.

[3] Ibid., 1934, i., 199.

[4] Statutory Rules and Orders, 1934, No. 889. H.M. Stationery Office. 1d.

[5] 1931, No. 341.

future. The order of 1931 which is now amended also establishes periodic medical examinations year by year during employment in a scheduled occupation. At these examinations suspension from work may be enforced, if lung disease is found, in the interests of the worker and of his fellows. The way in which these examinations provide valuable data for studying the cumulative effect of the specific dust hazards and the clinical progress of the resulting pulmonary damage is well set out in a recent article [*] by Dr. T. Ferguson on silicosis among sandstone workers in Scotland and the North of England. He shows how sandstone dusts generally render the lungs liable to dyspnœa, bronchitis, and the like, but only certain stones originate the specific silicotic condition; furthermore, wide individual differences exist in capacity to deal with inhaled silica.

CHILDREN IN THE ALPS

THE council of the Queen Alexandra Sanatorium Fund has decided on an important change in policy. The fund, which owes its origin to the appeal for the foundation of an English sanatorium in Davos made by the late Lord Balfour of Burleigh 30 years ago, has investments valued on the Stock Exchange at £64,000 and an annual income of about £2400. Since the sanatorium was given up as a war-time necessity it has been the custom to allocate the income to enable patients of small means suffering from curable tuberculosis to stay long enough in Davos to make a substantial recovery. Last year the number of suitable cases applying for grants was not very large, and it was possible to extend the grants for more than the usual five or six months on medical advice in Davos—an innovation which has the warm support of the London Council; but those who administer the fund have recognised that a limited stay in the Alps, particularly if, as at present, it must be followed by a return to straitened conditions at home, does not produce the best possible return for expenditure. This may be a heartless view of the situation, for there is no question that whatever the effect on physical signs the fund has been able to infuse some cheerfulness and happiness into many lives; there can, however, be little doubt that a strict analysis would prove disappointing, although grants have not in principle been made to patients in an advanced state of the disease. For the last two years the council has had an object-lesson of a different kind in the Davos valley. Owing to the generosity of the president of the Birmingham Children's Hospital (himself a Swiss subject) and the enlightened imagination of its staff, a group of 40 or more Birmingham children have had the opportunity of spending several months in the alps, with results which have been critically watched and assessed by a number of British and foreign pædiatricians. About one-half of these children had had various forms of surgical tuberculosis; the remainder illnesses such as asthma, interstitial pneumonia, recurrent bronchitis, debility, and malnutrition after prolonged ill-health. When last reported, of the 80 children who had been to Switzerland, 41 were discharged "cured" after a stay averaging seven months, and at a cost per patient per week of £2 2*s*. 8*d*.

The experiment is said to have exceeded the expectations of its promoters, and it was this object-lesson which induced the council of the Queen Alexandra Fund a year ago to adopt the principle of helping children. At that time negotiations for collaboration with the Birmingham scheme did not mature and the money was allowed to accumulate, so that for the coming year there is a larger balance available for this purpose, and in fact the council has agreed to allot, if suitable cases offer, as much as half its available income for the purpose. No hard-and-fast rules have yet been laid down as to the qualifications for a child candidate. There is perhaps even now insufficient exact information about the value of the climatic factor in the cure of childish ailments to form a final opinion, but the late Prof. Leopold Moll, from his experience in organising recreative holidays for children of 6 to 12 years old in the Italian, Swiss, and Austrian Alps, formed opinions which must command respect.[1] For children of weak constitution with secondary anæmia, with bronchial asthma, and especially with infiltration of the bronchial glands, he held the alps superior to the seaside, and in his last published work he was impressed with the large percentage of children who could be rid of a relapsing bronchial catarrh by a winter cure in the high alps. The fund's honorary examining physicians in London will decide on its merits any application received for help from the fund, which now has the benefit of the advice of Prof. L. G. Parsons, who was elected a member of council at the recent meeting. It might be thought that there would be difficulties in inducing parents to part with their delicate children to the care of strangers for so long a period, but that has not been the Birmingham experience, and the two institutions in Davos, to one or other of which the children would be sent, have a reputation for homeliness which will soon reassure the faint-hearted.

Practitioners with youthful patients who would, they think, benefit under the scheme should apply for further information to the hon. secretary of the council, Mr. A. Stanley Herbert, 25, Birchin-lane, London, E.C.3, or to the local secretary, Mr. W. G. Lockett, Davos-platz, Switzerland.

MR. SERJEANT SURGEON KNIGHT

A CORRESPONDENT asks for information about serjeant surgeons in general and Dr. John Knight in particular. The serjeant surgeons of England have succeeded each other in an almost unbroken series from 1461 until the present time. They were generally two in number, although occasionally an additional one was appointed or the emeritus title was bestowed on someone whom the King wished to honour. The serjeant surgeons ranked above the King's principal surgeon. It was their especial duty to attend the King on the field of battle. For reward they received a yearly salary of 40 marks (£26 13*s*. 4*d*.) with a "bouge of Court," which was an allowance of meat and drink "with wine, wax and all requisites for carrying out their cures." The wax seems to have been used for embalming the bodies of deceased members of the royal family. Mr. Serjeant Surgeon Knight complained in 1662 that he had received the usual fee for embalming the body of the Duke of Gloucester, but was ordered to divide it with Richard Wiseman, surgeon in ordinary. Various additional privileges appertained to the office in earlier times. The serjeant surgeon was entitled to be considered a past master of the United Company of Barbers and Surgeons. When the company was dissolved in 1745 he was always appointed to the honourable and lucrative office of examiner in its successor the Surgeons' Company. The privileges were curtailed little by little, the official remuneration was con-

[*] Jour. of Indust. Hyg., July, 1934.

[1] THE LANCET, 1933, i., 710.

solidated and reduced, until in the end the honour alone remained.

Something is still known of John Knight. He attended Charles II. on his voyage from the Hague to Dover in 1660, and thus became known to Mr. Samuel Pepys, who dined with him on Dec. 30th, 1662. The diary records—

"Thence to a Barber's and so to my wife and took her at noon to Mrs. Pierce's by invitation to dinner, where there came Dr. Clerke and his wife and sister and Mr. Knight, chief surgeon to the King, and his wife. We were pretty merry, the two men being excellent company."

Knight was constantly occupied with matters connected with the sick and wounded during the Dutch wars and the records of St. Bartholomew's Hospital contain a letter from the Duke of Monmouth, dated Sept. 10th, 1678, asking that sick and wounded soldiers may be received into the hospital on the recommendation of Mr. Serjeant Knight, chirurgeon generall. He may perhaps have been in attendance on his royal master during the Commonwealth period, for on Jan. 5th, 1661, he applied to the governors of St. Bartholomew's Hospital for the minor office of "guide" to the Lock Hospital in Old Kent-road. He brought with him a letter of recommendation from King Charles and was twice interviewed with a view to his election. He seemed to look upon the post as a sinecure and was not chosen. The governors saved their faces by replying to the King that "they had a respect and tenderness to His Majesty's displeasure if they should have conferred the said place upon the said Mr. Knight, hee being constantly soe neer the King's person and the bussines of the said place soe offensive and nautious." It often proved the first rung on the ladder to success, for the guide became assistant surgeon and in due course full surgeon to the hospital.

Knight is still remembered at the Barbers' Hall in Monkwell-street, where he was twice Master of the Company. He restored the priceless cup given by Henry VIII., and he persuaded Charles II. to present the acorn cup in commemoration of his escape at Boscobel. It is also stated that Knight identified the bones of the princes in the Tower and was instrumental in getting them buried in Westminster Abbey in an urn designed by Christopher Wren.

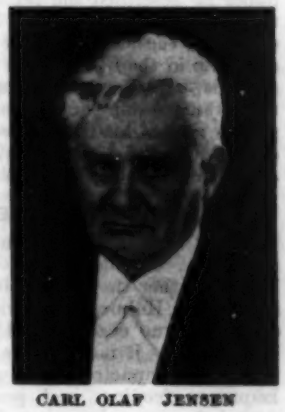
ACETYLCHOLINE IN RHEUMATISM

THE use of histamine in arthritis—given by ionisation or injection—has won much support.[1] Another substance capable of increasing the local circulation of blood is acetylcholine, and like histamine it has been applied to rheumatic joints by ionisation. The actual drug used by J. Kovacs [2] was acetyl-beta-methylcholine, a choline compound which is said to be more slowly destroyed in the body than acetylcholine, while its vasodilatory action is more prolonged and its side-effects are almost negligible. Ionisation is carried out with an asbestos fabric paper pad soaked in a 1 per cent. solution of the compound, and applied under the positive pole of the circuit, a large moist pad electrode being applied to the back of the patient and connected with the negative pole of the battery. The local effects noted were increase of skin temperature up to 10° F., sweating, reduction in swelling, and increased mobility of the joint. If large areas were treated general effects—such as flushing, sweating, increase in pulse-rate and slight fall in blood pressure, salivation, and evidence of increased intestinal peristalsis—might be observed. The results of treatment were best in patients with rheumatoid arthritis. Reduction of pain, swelling, and stiffness was noted in a majority of these after six or eight sessions at the rate of two a week; the patients had been selected for treatment because other methods had failed to help them. In smaller groups of cases of osteo-arthritis, bursitis, sciatica, and neuritis encouraging results were also obtained. However, Kovacs wisely concludes that before the value of this form of treatment can be accurately measured, observation of patients over long periods will be necessary.

[1] See THE LANCET, 1933, i., 920 and 988; 1933, ii., 1018; 1934, i., 1226, 1228, and 1366.
[2] Amer. Jour. Med. Sci., July, 1934, p. 32.

A PIONEER OF CANCER RESEARCH

THE death of Prof. Jensen, director of the serological institute of the Royal Veterinary College of Copenhagen, removes a historical figure from our midst. Born on March 16th, 1864, he came as a young man under the influence of C. J. Salomonsen and of B. Bang, and took part in the development of what was then the new science of bacteriology. He was interested mainly in the bacterial infections of animals, especially domesticated animals, and published numerous papers on this subject. But important as this aspect of his work is, it is overshadowed by the impetus he gave to the investigation of cancer by his publication in 1903 in the *Centralblatt für Bakteriologie* of a paper entitled "Experimentelle Untersuchungen über Krebs bei Mäusen." Having found repeatedly mice with malignant new growths he had tried to transmit the disease to other normal mice, but at first without success. Eventually, in 1901, he succeeded in transmitting a spontaneous mouse carcinoma to other animals and in propagating the tumour through 19 generations of mice. This tumour, which Jensen freely distributed to other laboratories where its propagation was continued, came to be known as the "Jensen mouse carcinoma." Jensen at once proceeded to investigate the nature of the process involved in this transmission of cancer. He showed that it is possible only in animals of the same species, that it demands the existence of living cells, and that the tumour develops in the new hosts from surviving cells which have been inoculated. The transmission is due, therefore, to a process of transplantation, and not to a process of infection. These observations were of fundamental importance and they have been amply confirmed by subsequent investigators.



CARL OLAF JENSEN

Jensen was by no means the first to have succeeded in transmitting a malignant new growth from one animal to another of the same species. He mentions himself the previous successful experiments of Hanau in 1889 with a rat sarcoma, of Morau in 1894 with a mouse carcinoma, and of Velich in 1898 with a rat sarcoma. Simultaneously with Jensen, Leo Loeb, in 1901, had also recorded the successful transmission of rat sarcomas. But these experiments had aroused little interest in the medical world and had been forgotten. The reason for this unfortunate

attitude was that clinicians and human pathologists were convinced that cancer was a disease peculiar to the human species, and that these tumours in animals had no bearing on the cancer problem as it appears in man. Hanau was so disappointed at the neglect of his work, whose importance he fully realised, that he committed suicide. But by the end of the century veterinary pathologists had accumulated a formidable mass of evidence demonstrating the occurrence of cancer in animals. In this country Sir John McFadyean had protested against the statement of clinicians that cancer did not occur in animals. In 1903 E. F. Bashford, the director of the newly founded Imperial Cancer Research Fund, had published a paper emphasising the importance of investigating cancer as a biological problem on a basis of comparative pathology, and in the following year he had demonstrated the occurrence of cancer with all its characteristic manifestations throughout the vertebrate kingdom. Jensen's work was certainly more thorough than that of his predecessors, but it also had the merit of coming at the psychological moment. Thus the experimental investigation of cancer was initiated.

Subsequently Jensen made two further contributions to the cancer problem. In 1909 he published a paper on "Übertragbare Rattensarkome." In this paper he described the tumour now so well known as the Jensen rat sarcoma. In the following year he discussed the occurrence of tumours in plants which resemble in their properties the malignant tumours of animals. His work was instrumental in establishing the transmission of cancer. Ten years after the publication of his first paper dealing with this aspect of the disease his colleague in Copenhagen, Prof. J. Fibiger, demonstrated its experimental production.

SKIN DISEASES OF DOGS

WHEN dogs develop skin lesions, such as eczema, ringworm, or mange, the owners usually want to know whether they themselves are likely to catch the infection. Holmes,[1] in reviewing the subject, points out that true eczema in the dog is non-infectious; he attributes it mostly to external irritation by dirt, parasites, impacted anal glands, and like causes. Improper feeding, and possibly renal disease, are regarded as predisposing factors; there is also a dry form of eczema common in certain breeds of dog, which probably originates from endocrine derangement. Removal of the cause of irritation and symptomatic treatment are generally effective. In ringworm, on the other hand, contagion to man is common. It occurs in the dog in dry and purulent forms, and disappears readily if infected areas are cleaned and treated with iodine, but some months must elapse before the danger of secondary lesions is quite over. Of mange also there are two kinds—due to different parasites—the sarcoptic and the follicular. The former, caused by *Sarcoptes scabiei*, is readily contagious to human beings, as was illustrated in a case reported in our columns not long ago.[2] Diagnosis, in the dog, depends upon the demonstration of the acarus, and this can be done without undue waste of time by the sugar flotation technique.[3] Treatment consists of clipping the whole dog and applying sulphur incorporated in an oily dressing. Treatment, if carried out whole-heartedly, is usually successful in four to six weeks. About follicular mange unfortunately very little is known, though it is all too common, especially in certain breeds of dog. The condition is characterised by the presence of a mite, *Demodex folliculorum*, in the deep layers of the epithelium; but as the same or a similar species is a regular inhabitant of the human skin, especially in "blackheads," it would be rash to regard it as the actual cause. The general opinion is that it is not transmissible to man, but in animals it is a serious matter; indeed in the old days it was considered incurable, and destruction of infected animals was usually recommended. In reviewing the subject recently, however, Sen[4] points out that although no specific treatment has yet been devised, the position is by no means hopeless; and, especially in the non-pustular forms, a cure can be effected in a useful proportion of cases. Innumerable types of treatment, both internal and external, have achieved popularity, and it may well be that recovery, when it occurs, is independent of specific treatment. Meanwhile it appears that any measures that tend to improve the general health of the dog may help to bring about recovery from follicular mange.

[1] Holmes, J. W. H.: Vet. Record, 1933, xiii., 603.
[2] THE LANCET, July 21st, 1934, p. 159.
[3] Sheather, A. L.: Jour. Comp. Path. and Therap., 1923, xxxvi., 273.

THE DIAGNOSIS OF PERNICIOUS ANÆMIA

IT might be thought that in the limelight thrown on pernicious anæmia by Minot, Murphy, and others since 1927 the disease would seldom escape recognition. Certainly some of those who suffer from it are embarrassed by the diagnostic and therapeutic enthusiasm of their medical and even lay advisers. Nevertheless Dr. E. Meulengracht,[5] whose work on pernicious anæmia has attracted wide attention, says that of over 200 cases admitted to his hospital about half had been given some other label before they reached his hands. One of the signs suggestive of pernicious anæmia, to which Meulengracht attaches importance, is premature whitening of the hair. Beginning sometimes as early as the twenties or thirties, it often gives the patient a peculiar stamp; and incidentally it is a feature apt to run in families. As regards the diagnostic value of gastric achylia, he considers that in the absence of helminthiasis if there is no gastric achylia the patient is certainly not suffering from pernicious anæmia. He has never seen an exception to this rule, and as for recorded cases of the kind he is inclined to dismiss them as figments of the imagination. He is also sceptical of the diagnosis of pernicious anæmia when the patient is young. His youngest patient was twenty-eight years old when the disease was first diagnosed, and among the 213 cases only 21 were under the age of forty.

DR. MAURICE FISHBERG, who died in New York on August 31st, will be gratefully remembered in the medical profession as the author of a text-book on pulmonary tuberculosis which for matter, manner, and sense of proportion left little to be desired. Its value was recognised by running into four editions. Dr. Fishberg was born in Russia 62 years ago, and went to America when he was 18 years old, qualifying in medicine at New York University in 1897. He became chief physician to the Montefiore Hospital and clinical professor of medicine in the University. His other strictly medical work was an American edition of Gley's "Internal Secretions." But perhaps his chief interest in life was a study of the physical anthropology of the Jewish race, a sphere in which his views did not meet with general acceptance.

[4] Sen, S. K.: Indian Jour. Vet. Sci., 1934, iv., 114.
[5] Nordisk Med. Tidskr., July 14th, 1934, p. 925.

PROGNOSIS

A Series of Signed Articles contributed by invitation

XVII.—PROGNOSIS IN EPILEPSY

THERE is probably no other condition in which the prognosis is more anxiously enquired for, nor any in which under certain circumstances it is more difficult to forecast.

The reason for anxiety is obvious. The difficulty in giving a prognosis is to be found in the fact that epilepsy is not an entity; many writers and teachers have emphasised this, and suggested that we should speak of "the epilepsies" rather than of epilepsy. This of course refers to what one is familiar with under the title of "idiopathic" as distinct from symptomatic epilepsy. As we are still ignorant of the ætiological factor in most cases of epilepsy, it is clear that the prognosis in such cases must be doubtful. The effect of treatment must be awaited before it is possible to forecast the future course of the disease.

LENGTH OF LIFE

Does epilepsy tend to shorten life? The answer is that it certainly does so in severe cases, but that early death as the result of a fit is rare. It is certainly possible for some accident to occur which may have a fatal ending during the course of a fit. There are occasional examples of a fit proving fatal to others; witness a recent case in which a car, driven by a person who had a fit, ran into a crowd of people and killed some of them. Status epilepticus is a rare and often fatal condition. Cases in which epileptic dementia occurs do not as a rule reach the allotted span of life. Many of them die of tuberculosis. In mild cases, however, it is not unusual for the patient to reach old age; indeed there is a tendency with advancing age towards spontaneous cure.

DAMAGE TO STRUCTURE OF BRAIN

In certain cases there has been some damage to the structure of the brain. I do not include among these cases where a brain tumour is present, or where the fits are the expression of syphilitic disease. In the first group the prognosis is that of the brain tumour; in the second the outlook is usually good when adequate treatment is adopted. The cases to which I refer are those which follow in the path of diplegia or hemiplegia occurring as the result of developmental defect or birth injury. In such cases there is always the possibility that fits will follow. The prognosis varies a good deal with the mental condition of the patient. If there is mental deficiency, the prognosis as regards the fits is always bad. If there is no mental defect, the probability of epilepsy developing is less and the prospect of the control of the fits under treatment better. The same criterion applies to children who develop fits following encephalitis, with or without hemiplegia. In adults fits may occur as a sequel to thrombosis of the Sylvian artery which has resulted in hemiplegia. The fits are as a rule infrequent and are usually controlled well by treatment, which must however be continued faithfully for a sufficient period—that is for as long as two years after the last fit. With the use of the barbiturates this can be done with less annoyance to the patient than was possible with bromides.

IDIOPATHIC EPILEPSY

In so-called idiopathic epilepsy there are many factors which will help to justify a bad prognosis, but unfortunately few which can be relied on to justify a good one. When the fits have started early in life, when they are frequent and severe, and when in addition there are stigmata of degeneration present, the prognosis is uniformly bad. Among stigmata we may note misshapen ears, deformed teeth in poorly developed jaws, Gothic palates and eccentrically shaped skulls. When some degree of mental deficiency is present as well, it merely serves to emphasise the hopeless prognostic outlook. A history of epilepsy in the antecedents, of insanity, alcoholism or drug addiction are factors of grave prognostic significance, as too may be consanguinity in the parents.

CONVULSIONS DURING INFANCY

Convulsions during infancy tend to affect the prognosis adversely in those developing epilepsy later in life. We must not be too pessimistic, however, in our prognosis in such circumstances, as some cases in which the outlook appears most discouraging do well under treatment. The converse unfortunately is also true, and a patient of fine physique and development, and with a clean sheet so far as family records go, may fail to respond to treatment in a satisfactory manner. Aldren Turner found that the percentage of cases arrested was much the same whatever the family record, but that those with no hereditary history showed a higher percentage of improved cases and a lower percentage of confirmed cases, than did patients with definite neuropathic antecedents. Special note should be made as to whether the family record shows evidence of any toxic idiopathy, or whether the patient exhibits such himself. In these cases, and where asthma and epilepsy may alternate in the same patient, the attacks are almost certainly allergic in origin. Careful research on these lines and appropriate treatment should result in marked improvement or cure.

THE TYPE OF DISEASE

The type of disease is of some importance in prognosis. It is well known that in petit mal it is more difficult to influence the frequency of the attacks than where grand mal attacks only occur. The introduction of the ketogenic diet has, according to American reports, resulted in marked improvement in children suffering from petit mal, as many as 31 per cent. of cases in children under 15 being free from attacks as the result of treatment. I do not know of any statistics based on the treatment of a large number of cases by this method in this country, but my own experience of it has not been so encouraging as that of the American observers. Mention must here be made of the condition known as pyknolepsy, in which children suffer from a very great number of daily attacks of very transient nature, so slight indeed as entirely to escape observation unless they are watched for most minutely. These attacks seem to be uninfluenced by any form of treatment, but the ultimate prognosis is good. Cases of grand mal only are more responsive to treatment as a rule than are cases of petit mal, whilst those who suffer from both grand mal and petit mal form an intermediate group. In the latter group, however, should the attacks be frequent, the probability of dementia occurring sooner or later is greater than in the other two groups.

Patients whose attacks are nocturnal only are more happily situated than those whose attacks occur only by day, but there is some evidence to

suggest that, in the former group, the attacks are less likely to be arrested as the result of treatment.

AGE-INCIDENCE

The age-incidence of the disease has some bearing on prognosis, for where epilepsy begins under the age of 10 the prognosis is usually worse than at any other age. Cases which occur at puberty are much more numerous than those which occur at the climacteric, though the outlook for the latter is better than for the former group. With advancing years as is well known, the tendency to develop "idiopathic" epilepsy diminishes. In what may be called senile epilepsy, taking the age of 50 (for this purpose only) as the beginning of the senile period, the prognosis is probably better than in any other group.

It is a truism that the longer the fits have lasted, the less chance there is of their arrest, and the prognosis so much the worse; epilepsy not being a self-limiting disease, but rather the reverse. Every effort should therefore be made to control the fits from the first.

TRAUMATIC EPILEPSY

Traumatic epilepsy is a condition in which fits develop as the sequel to a brain injury. It does not seem that those cases in which fits occur at the time of the injury are more likely to develop epilepsy subsequently than when this is not the case. The injury to the brain may affect any part of it. I mention this because I have met with a fairly widespread belief that unless the motor centre is injured epileptic attacks will not occur as a sequel. The attacks may be of any variety, either focal (Jacksonian) or generalised. Grand mal, petit mal, or both may occur in this group of cases. Statistics vary as to the proportion of cases of head injury in which epilepsy follows as a sequel, but it is much smaller than one might expect. Percy Sargent found only 800 in 18,000 cases of head wounds. Bathe Rawling, in a smaller group of cases, found a much higher percentage of epileptic incidence—namely, 25 per cent. in a series of 425 cases. In any particular case of head injury the odds are against the development of epilepsy as a sequel. When it does occur, it will be found that in many cases the fits can be controlled by adequate medical treatment. In some instances, as Foerster and Penfield have shown, surgical intervention with removal of scar tissue will result in cessation of the fits. Where fits occur in association with severe injury of the brain, the probability of dementia occurring is considerable. In such cases the fits are likely to persist in spite of treatment.

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SPECIAL ARTICLES

THE UREA-CLEARANCE TEST

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THIS paper contains a discussion on the urea-clearance test as elaborated by the work of Addis and Van Slyke. The observations recorded were made on 2 normal controls and 16 patients in St. George's Hospital.*

It has long been known that the efficiency of the kidneys to keep the blood constituents at a constant level is seriously damaged in Bright's disease, and a need was felt for some method of expressing in numerical terms the remaining power of the kidney. Such a method would materially assist the physician in following the course of a case of nephritis, and would be invaluable for prognosis; and some such test, no matter how rough, is essential before many surgical procedures may be undertaken. In some cases, in which an acute illness, such as scarlet fever, is followed by an acute nephritis which clears up but for a slight persistent albuminuria, an expression for kidney function is needed before it is possible to say whether the kidney is permanently damaged.

In searching for some one constituent to use as an indicator of kidney function, attention was soon directed to urea. This substance is physiological (that is, it is not foreign to the normal environment of the working kidney), it is present in blood and urine in easily measurable quantities, it is a non-threshold body, and it is non-poisonous, so that for purposes of experiment it may be given in large quantities. At first it was proposed to use the urine urea alone; but this is liable to so many fluctuations owing to food, exercise, and urinary volume that the results obtained are not consistent. Modifications of this test, however, such as the urea percentage in urinary samples obtained after taking urea by mouth, are still in practice. Then it was proposed to use the blood-urea alone; this was soon abandoned, for it was found that the blood-urea did not rise after one kidney had been removed and the functioning tissue had thus been reduced to half. This showed that the blood-urea level could not be used as a measure of kidney function.

On theoretical considerations alone, it appears impossible to separate these two factors. The environment in which the kidney works is the blood stream, and it is evident that the results of its labours will depend upon the concentration of the urea in that stream. It is also clear that the concentration of the urine will not be, in general, independent of the volume of the urine. It was these considerations which led many workers to investigate the relations between all these factors.

The first to publish results was Ambard.[1] He published two numerical laws, expressing a relation between the blood-urea, the concentration of urea in the urine, and the amount of urea passed by the kidneys.

His laws were as follows: When the concentration of urea in the urine was constant then the blood-urea varied as the square root of the urea passed; and when the blood-urea was constant then the quantity of urea passed varied inversely as the square root of the concentration of the urea in the urine. Nowadays it is usual to express all the data in terms of blood-urea (=B), concentration of urea in the urine (=U), and the volume of urine passed in unit of time (=V). The usual unit of time is one minute. Expressed in these quantities Ambard's law becomes: $\frac{U\frac{1}{2}V\frac{1}{2}}{B}$ is constant. This constant can be worked out for normal individuals, and then the value obtained in cases of nephritis compared with it. This method was much used by French clinicians during the first decades of this century.

* The 2 controls and 5 of the patients were seen by me, and I collected the specimens from them. The details of the other 11 cases were collected from the medical register of the hospital. All the biochemical analyses were performed in the hospital biochemical laboratory.

In America, Addis and Watanabe tried to verify this work. They discovered [3] that the law did not hold good in very many cases, and concluded that Ambard only obtained the agreement he did because his material was so scanty. They found that the law did not even give the trend of results—i.e., according to the law, when the blood-urea is constant, if the concentration of urea in the urine rises then the total quantity of urea passed should diminish, whereas it often increases. They performed many experiments, both on rabbits and human beings, in an attempt to formulate a law which would give better agreement.

After much testing, Addis and his co-workers came to the conclusion that the ratio—urea in urine : blood-urea—was constant both for the individual and for the species, provided certain conditions were in force. The most important of these conditions was that the kidneys should be working at full load. It is known that there is a large reserve power in the kidneys, so that unless they are exercised to their full extent slight damage will not be apparent. Hence it is important to give urea and water by mouth, and so cause a forced diuresis. They found that the ratio fluctuated with the urine volume, but not regularly so, and that it was much more stable when the urinary volume was high—another reason for encouraging diuresis.

As an example of the importance of giving urea, they worked out the ratio on a rabbit before and after ligating one ureter [3] and found no difference; but on comparing the ratio before and after the operation, having given urea in each case, the ratio was depressed to half its former value. This was confirmed in a later piece of work.[4] Here it was shown that when recovery after nephrectomy has taken place, the urea excretion can be as large as 98 per cent. of the normal, even though the amount of functioning kidney tissue, as measured by the weight of the remaining kidney post mortem, was only 66 per cent. of the total kidney tissue before the operation. The ratio was the only numerical evaluation of function that was depressed by the operation.† Finally, all this has since been confirmed on dogs.[5]

Let us consider the meaning of this ratio with regard to the working kidney. The ratio is the result obtained by dividing the total quantity of urea excreted by the kidneys, in one minute, by the quantity of urea contained in 100 c.cm. of blood. It is therefore equal to the number of cubic centimetres of blood cleared of urea in one minute. Thus, expressing Addis's results in words, it means that when the kidney is working at full pressure, then the quantity of blood cleared of urea in one minute is fixed, and is independent of the concentration of the urea in the urine. In a number of normal human beings this number came to 75–76 c.cm., and this has been taken as the normal figure for kidney efficiency. It is important to realise that this figure, and its explanation, as the amount of blood cleared of urea, is independent of any theory as to how the kidney performs its work. It must not be taken as meaning that actually 76 c.cm. of blood flow through the kidney, and that this quantity is completely cleared of urea; there is evidence, based on urea estimations of the blood in renal artery and vein,[7] that only 50 per cent. of the urea is cleared. This would mean that 152 c.cm. of blood flow through the kidney, losing half their urea while so doing. This figure for the renal blood flow is confirmed by the figures of the creatinine clearance.[8]

In another series of experiments, Addis measured the value of this ratio on rabbits of different sizes, on rabbits after experimental nephritis, and after nephrectomy, and showed [9] that the value of the ratio was almost perfectly proportional to the weight of the kidney tissue, as measured post mortem. He found, too, that in human beings this ratio was not quite constant, but differed according to the size of the individual.[10] This was confirmed by McKay,[11] who showed that the ratio varied with the surface area of the body, and that the kidney weight also varied directly with this expression; this was confirmed by Van Slyke [12] working on children. He showed that the ratio was proportional to the surface area, and that the weight of the kidneys was proportional to this and not to the body-weight.

It appeared, then, that in this ratio clinicians possessed a numerical expression of the functioning power of the kidney. In order to make sure that it did not depend on factors outside the kidney, a further series of observations was taken on this ratio under different conditions. Thus it was found that both adrenaline [13] and pituitrin [14] affected it somewhat, while the ingestion of salt [15] and dextrose [16] had no effect. The taking of food increased the ratio, but only after the fourth hour; this appears to be due to the protein alone,[17] for it has been shown that the purin diuretics have no effect on the ratio,[18] while fasting [19] and low protein intake [15] lower it. In confirmation, high protein feeding raises the ratio.[20] It was shown, too, that vigorous exercise would lower the ratio to 50 per cent. of its normal value,[21] although it appears that mild exercise in normal people might raise it [22]; but in nephritics even mild exercise depresses the ratio considerably.[23]

TECHNIQUE

In order to get comparative results, Addis and his workers then formulated the following technique, which keeps all the foregoing factors constant:—

1. The test is done when the subject is in bed.
2. In order that the effects of food may be eliminated, the test is done first thing in the morning, and no breakfast is given.
3. Fifteen grammes of urea are given at 7 A.M. in 1000 c.cm. of water. Then, till 12 noon, the subject drinks 500 c.cm. of water hourly. This raises the blood-urea and causes copious diuresis.
4. Urine is collected for each of the hourly intervals, from 9–10, 10–11, and 11–12. Blood is collected about half-way in each hourly interval.

The chief objection to this technique is that it involves the patient being in hospital overnight, and three blood collections. This first condition makes it difficult to carry out the test in private practice. Also, in cases of nephritis, it disturbs the patients to collect the urine so frequently, and some of them, especially women, find difficulty in emptying the bladder completely while lying down. It must be emphasised that consistent results are obtained only when the physician himself collects the various specimens; otherwise it often happens that the urines are not collected at the proper times. Often the patient cannot empty his bladder just at the right moment; but this is immaterial if the

† Addis explains the fact that the remaining kidney was as much as 66 per cent. of the two together, before operation, on the grounds of compensatory hypertrophy. It is known [6] that this hypertrophy can take place under certain conditions. Even so, the value of the ratio was 78 per cent. after nephrectomy, instead of the expected 66 per cent. This was explained by Oliver in the same paper, who showed, on careful sectioning of the remaining kidney, that the hypertrophy affected chiefly the glomeruli and the first part of the convoluted tubules—i.e., just the secreting parts of the kidney. This means that the true functional hypertrophy was greater than the gross hypertrophy, as measured by the increase in weight of the kidney. There was no evidence of hypertrophy in the dog,[5] and here the weight of the remaining kidney was 54 per cent. of the total renal tissue, and the ratio was 56 per cent. of its value before the operation.

actual time is noted, as what is wanted is the minute volume, not the total quantity passed.

It must be mentioned that some other workers attempted to verify Addis's work,[24] but did not find consistent results. On close examination of their data it appears that they left the collection of the specimens to nurses, and did not force diuresis by withholding urea. These factors are quite sufficient to invalidate their results; hence their criticism of Addis lacks weight.

In order to simplify the technique Van Slyke and his co-workers [25] undertook a complete re-examination of the whole problem. They investigated the relations between the blood-urea (=B), urine-urea (=U), and urine volume (=V) when the kidney was not working at full load. They also made the correction for surface area, by estimating the surface of the subject from the height and weight, comparing this area with the normal of 1·73 sq. metres, and dividing the urine volumes by the factor so obtained. They considered the relation between V and the ratio U : B. They gave the term "clearance" to the quantity of blood cleared of urea in 1 min.=UV/B. They found that, provided V was more than a limiting value, this clearance was constant both for the individual and for the species. In a later piece of work [26] they showed that for most individuals this limiting value was 2 c.cm. Incidentally, this confirms Addis's work, for the diuresis produced by 15 g. of urea always raises V above this figure, and Van Slyke's clearance is the same as Addis's ratio, which is therefore also shown to be constant. This limiting volume they name the "augmentation limit."

But it was further discovered that even when the urine volume fell below this limit, there was still a relation between the clearance and the urine volume. It was found that the clearance varied as the square root of V. From this it follows that, in order to compare different individuals, it is first necessary to find out what their clearances would be at some standard volume of urine per minute. The standard volume which they chose for this purpose was 1 c.cm. per minute, for this simplifies the arithmetic of the calculation, and also is the average normal urinary output (for 1 c.cm. per min.=1440 c.cm. daily, which is approximately the normal output). The clearance calculated to this level of volume they called the standard clearance, written C_s, and it is numerically obtained by the formula $UV\frac{1}{2}/B$ (for if UV/B varies as $V\frac{1}{2}$, then $UV\frac{1}{2}/B$ must be constant). The value of C_s for the normal individual is 54 c.cm., although Bruger and Mosenthal [22] obtained higher figures. The clearance obtained when the minute volume is above the augmentation limit they called the maximum clearance, written C_m. Its value for the normal individual is 75 c.cm. The close similarity between this standard clearance formula of Van Slyke and Ambard's law is apparent when they are compared: the one is $UV\frac{1}{2}/B$, the other $U\frac{1}{2}V\frac{1}{2}/B$; and as U varies from 1–2 usually their value is nearly equal. It can also be shown that the two values for the clearance are mutually consistent. Thus, let us imagine a case where V was just about 2 c.cm. per minute. Then we could calculate the kidney efficiency from either formula, and the ratio between these two values would be $UV/B : UV\frac{1}{2}/B$, or $V\frac{1}{2} : 1$; and as V=2 this would equal 1·4 : 1. But the ratio of $C_m : C_s$ is 75 : 54, or also 1·4 : 1.

It is clear that now we have a much simpler method of estimating kidney function. It is sufficient to keep the subject quiet, and there is no need to give urea or to attempt diuresis (in many nephritics it is not possible to cause diuresis). All that is necessary is to collect two consecutive specimens of urine at hourly intervals, and to obtain one specimen of blood mid-way between these two; then, if V is greater than the augmentation limit of 2 c.cm. per minute, the formula for maximum clearance is used, and the result compared with 75; otherwise the standard clearance is calculated, and the results expressed as a percentage of 54.

This technique was adopted in all the cases here collected. In order to make sure that there would be no complications due to food the test was done in the morning before breakfast. At 9 o'clock the patient emptied his bladder, and that was discarded; then the urine was collected at 10 and again at 11 o'clock. A sample of blood was taken at 10 o'clock. In each case if the patient did not empty his bladder at the precise time then a careful note was taken of the hour, and so the minute volume could be calculated. In some cases 15 g. of urea was given beforehand in a quantity of water.

Comparisons have been made of this test with others. Thus the rise of plasma sulphates runs parallel with a fall in clearance,[27] but the series was too small to allow conclusions to be drawn. It is much more delicate and accurate than the uric acid level.[28] Anæmia runs parallel to the older tests for kidney function,[29] but this test is more delicate than the older ones, so that it gives evidence of kidney impairment before the blood does. Figures obtained by considering the creatinine clearance correspond very closely to those given by urea clearance, but the estimation is much more difficult to carry out.[30] Bruger and Mosenthal [31] and Van Slyke [32] both find that this test is the best and most delicate of all those in common use.

FINDINGS

Before considering the results obtained in this series a brief review of the literature may be appropriate. The first to be noticed is the work of Addis, who followed up several cases from the onset of the disease to the termination in death or recovery.[9] Van Slyke and his co-workers trace 67 cases of Bright's disease [33] for long periods. There it is shown that in acute nephritis the clearance always fell to 50 per cent., and may fall as low as 20 per cent., but this fall has no prognostic importance; they were, however, able to draw the important conclusion that if no improvement took place in four months the case was certain to end fatally. It was not possible to draw inferences in the other types of Bright's disease. Life could be maintained comfortably on 15 per cent. of functioning tissue, but uræmia is certain when it drops as low as 5 per cent. It is also known that the blood-urea does not rise till the clearance falls to 50 per cent.[34] Van Slyke has since worked out a quick colorimetric method of evaluating the clearance.[35]

Other workers have since published series of cases. In the United States Bruger and Mosenthal [36]; in South America, Schultz Ortiz [37]; in England, Poulton and Ryffel [38]; and in Italy, Lazzaro.[39] All these workers confirm Van Slyke's conclusions. The value of the test in pregnancy and the puerperium has been pointed out by several American investigators.[40 41 42 43] In this last paper, however, Cantarow and Ricchiuti find low values during normal pregnancy, which values rise to the normal during the puerperium; this was not found by any other worker in this field. In children the test is useful but difficult to interpret,[44] probably owing to the difficulty of finding the augmentation limit.[45] Finally, tribute to

the test in urological surgery has been paid both in America [46] and in this country,[47] though opinion is not unanimous on its being the best.

The results obtained at St. George's Hospital are set out in Table I. I wish to thank the members of the honorary staff for permission to quote cases.

TABLE I

Case.	Clearance.	Percentage of normal.	Case.	Clearance.	Percentage of normal.
1	S.	103	9	S.	66
2	S.	93	10	M.	100
3	S.	30	11	M.	26
4	S.	26; and 1 wk., later,	12	S.	9
	M.	21. and	13	S.	22
	S.	26	14	M.	15, and
5	S.	19; and 2 wks., later,		S.	18
	M.	42	15	M.	20
6	S.	20, and	16	M.	83, and
	M.	12; and 6 wks., later,		S.	91
	S.	11	17	S.	60
7	S.	45; and 1 wk., later,	18	M.	22
	M.	51			
8	M.	26, and			
	S.	11			

S. = standard; M. = maximum.

In those cases where only one number stands in the "percentage of normal" column, it means that both specimens of urine were standard or maximum, and the number given is the average of the two estimations obtained.

These cases fall into three groups, according to the degree of impairment of the renal efficiency. (Table II.)

TABLE II

Group I. Kidney function normal.		Group II. Moderate impairment.		Group III. Severe impairment.					
Case.	P.N.	Case	P.N.	Case	P.N.	Case	P.N.	Case	P.N.
1	103	7	48	3	30	8	18	14	16
2	93	9	66	4	24	11	26	15	20
10	100	17	60	5	32	12	9	18	22
16	87	..	..	6	15	13	22	..	..

P.N. = Percentage of normal (averaged).

In each case two specimens of urine were obtained, so that two estimations of kidney function were made for each test. In the majority of cases both these estimations were either standard or maximum, but in five cases one was standard and the other maximum. Estimations have throughout been expressed in percentages of the normal, so that it is possible to compare results obtained in either of these forms. In two cases (Nos. 6 and 8) the differences are considerable: the figures are 20 and 12, and 26 and 11. Both these patients are females, and the error is probably due to incomplete emptying of the bladder on the first occasion. The test was repeated later on No. 6, and the result obtained then agreed with that given by the second specimen of urine on the first occasion, bearing out this theory as to the error. In four cases (Nos. 4, 5, 6, and 7) the test was repeated after an interval. In Nos. 4, 6, and 7 the second result was very close to the first, but in No. 5 there was a wide divergence, from 20 at the first to 42 at the second occasion. This cannot be explained by an improvement in the clinical condition, which actually deteriorated. There was probably some error in the actual performance of the test. The correction for surface area was neglected. This does not appear to have invalidated the results, for they closely follow the clinical findings. In the case of No. 16, a youth aged 13, a figure of 86 per cent. would have been nearer 100 per cent. if this correction had been made.

Nos. 1 and 2 were normal controls, and their figures, 103 and 93, are well within the limits of normal variation. No. 16 was suspected of chronic nephritis on the grounds of an attack of scarlatinal nephritis and occasional albuminuria. The test showed perfect function. No. 10 was suspected of nephritis because he had persistent pains in the back and was puffy under the eyes. The clearance was normal, and radioscopy showed lumbar osteo-arthritis. All these cases have normal function, and clinically also there was no nephritis.

The next group show moderate impairment. No. 17, with a clearance of 60 per cent., had signs of nephritis, in that there was persistent albuminuria, but the blood pressure was low and there were no other signs of disease. No. 9 was a surgical case, who showed 66 per cent. of function; in accordance with this, prostatectomy was perfectly successful. No. 7 had definite signs of general arterial disease in his legs and thorax, and actually died of a coronary thrombosis. He showed a trace of albumin in his urine, and his clearance was 48 per cent. of the normal. It is noteworthy that his blood-urea, without the ingestion of urea, was 0·044 per cent., which is only just outside the bounds of normality, while as shown by the test he had only 50 per cent. of functional renal tissue.

All the other cases show marked impairment of function, and there was corresponding clinical evidence of advanced nephritis. No. 3 had bilateral hydronephrosis and polycystic disease. He had a clearance of 30 per cent., and clinically was very ill. No. 4 had severe nephritis of the "nephrotic" type, and her clearance was about 23 per cent. of the normal. In her history after leaving hospital she showed a tendency to low-grade septic conditions. No. 5 was a severe nephritic, with a clearance of about 20 per cent. at first, which rose later to 40 per cent. No. 6 was in the terminal stages of acute hæmorrhagic nephritis following tonsillitis. Her clearance at first was 16 per cent., falling six weeks later to 11 per cent. A few months later she died in uræmia. No. 8 was first diagnosed as nephritis during a pregnancy. It is not possible to say from the history whether she had nephritis before her pregnancy or whether it was the latter event which started the kidney trouble. When seen in hospital she had advanced nephritis clinically, and her clearance was about 18 per cent. No. 11 was in hospital over one year ago with severe nephritis. On admission this time her clearance was about 25 per cent. Her illness started six years ago with scarlatina. No. 12 was a very severe case, with a blood pressure of 235/155. Her clearance was 9 per cent., and her vision was failing. Probably she was near uræmia. No. 13 was a nephritic, with a history of decapsulation performed 13 years ago. He showed signs of nitrogen retention, and his clearance was 22 per cent. No. 14 is very similar. Her clearance was only 17 per cent., and her blood pressure 240/140. No. 15 had scarlatina 12 years ago. He had signs of advanced kidney disease, with nitrogen retention. His clearance was 20 per cent., and five weeks later he died in uræmia. Post-mortem findings include small atrophic kidneys and an enlarged heart. No. 18 had severe nephritis, with a clearance of 22 per cent. It was not certain whether his disease was due to the syphilis from which he was suffering or whether it was caused by the arsenical treatment he had been having.

SUMMARY AND CONCLUSIONS

The development of laws concerning kidney excretion is described, leading up to Addis's ratio and Van Slyke's modification of it. This worker showed that if the urinary volume was greater than the "augmentation limit" of 2 c.cm. per minute, then the expression UV/B was constant, and, if not, then $UV\frac{1}{2}/B$ was constant. It was further shown that the amount of functioning kidney tissue was proportional to the value of this constant, and therefore in cases of nephritis it gave a valuable measure of

the renal damage. It is, however, not safe to trust to one single estimation if it gives a low value.

Various workers have shown that this estimate of kidney function follows the clinical condition of the patient better than any other. The value of the estimation afforded by the test is greatest in cases of moderate impairment, for most other tests show no difference at all in these circumstances. Thus it has been shown that at least half of the functioning tissue must be destroyed before the blood-urea rises. Eighteen people were subjected to the test, and in all cases the test was an accurate picture of the clinical condition.

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HERTFORD BRITISH HOSPITAL, PARIS.—This hospital, which was founded and endowed by the late Sir Richard Wallace, has had an annual deficit since 1930, due to the increased cost of living and the necessity of providing additional accommodation. The fall in the exchange value of the pound has now reduced the income by about 40 per cent. and there is an annual deficiency of £2000. The hospital gives its services to all subjects of the Empire living in, or visiting, France.

BRITISH MEDICAL ASSOCIATION

MEETING IN BOURNEMOUTH

SECTION OF SURGERY

Prof. G. GREY TURNER, the president, took the chair at a meeting of this section when a paper on

Physical Efficiency after Operations for Hernia

was read by Mr. MAX PAGE (London). In five years' operations at St. Thomas's Hospital, he said, the relative incidence had been 11 inguinal hernias, 1·4 femoral, and 1 ventral. He therefore took inguinal hernia as his text. In spite of all the consideration given to it, agreement about the best method of treatment had not been reached, largely because the information about late results was inadequate or inaccurate. A close and critical follow-up of all cases would reveal a far larger proportion of recurrences than was generally believed. His own confidence in the operation had been shaken by his experience with the Metropolitan Police; for in the five-year period 1929–34, of 241 operations performed on police officers, 11·5 per cent. were for recurrence. Further investigation suggested that the true rate was even higher. Block's analysis of continental figures gave a recurrence of 34·8 per cent. after two years, and this author declared that 40 to 45 per cent. of recurrences were avoidable. The majority seemed to be internal direct hernias, and the suture material used seemed to have little influence. After quoting the numbers in other reports, Mr. Page admitted that he really did not know quite what he wanted to prove. The astonishing differences between the statistics he had quoted could hardly be laid at the door of any special technique. His own conviction was that recurrence was commoner and more difficult to avoid than was generally thought. The factors influencing success were the technique and its failures, post-operative pulmonary complications, operation on double hernias, and congenital feebleness of the musculature.

Mr. G. L. KEYNES (London) declared that the only possible attitude was to aim at complete physical efficiency and deal with almost every hernia. No patient should be condemned to wear a truss after operation, and every patient, except possibly the old and infirm, should be able to carry on with his work. Out of 10,000 or 12,000 patients whom he had attended at the City of London Truss Society, only 500 or 600 had had recurrences. There was too much dependance on standardised operations, and the surgeon must possess a sufficiently large operative repertory for all cases. Incorrect diagnosis between direct and indirect hernias was a prolific cause of recurrence. All recurrence was due to failure in technique, for if the tissues were not strong enough a more elaborate operation was called for. The allegation of a hereditary tendency was merely an attempt to justify failure. He showed a number of slides of various conditions many of which illustrated the use of Gallie's fascial suture.

Mr. T. A. HINDMARSH (Newcastle-on-Tyne) reviewed 154 cases operated on in hospital, nearly all labourers. Out of 102 patients with inguinal hernia 89 were perfectly satisfied, 9 had recurrences, and 4 had severe pain and tenderness in the scar. Twenty-three out of 26 femoral, 11 out of 13 umbilical, and 8 out of 13 ventral operations had been successful. It was nearly always possible to succeed in the important aim of saving the patient from wearing a truss. It was

essential to remove the sac completely. Sixty per cent. of recurrences were due to suppuration and infection, and a fairly large proportion to choice of a wrong type of operation. It was dangerous to tie sutures too tight, and if they were not tied carefully the conjoined tendon might be split. He considered that three weeks was not a sufficiently long convalescence. It took six weeks to get firm fibrous tissue, and he would therefore advocate three weeks in bed, followed by ten days on a couch and then by six weeks' progressive exercise. If the anæsthetist allowed the patient to come round too soon, damage might be done on the table through vomiting before bandages were firmly applied. Excessive distention of a ventral hernia before operation should be controlled by 0·5 c.cm. of pituitary extract every three or four hours.

Mr. E. M. COWELL (Croydon) mentioned as factors in success wide resection of the hernia sac, the covering of the weak point with suitable pedunculated fascial flaps, the use of fascial sutures, and the encouragement of a return of muscle tone with suitably graduated exercises. Peebles's hernia of the linea semilunaris was rare but important. He had found 6 in 500 cases, 2 having been overlooked at the original operation. He showed slides illustrating his modification of Gallie's method by which he used a much shorter strip of fascia. He recommended that patients should be directed to contract their abdominal muscles at about the fourth day, and that they should be out of bed at the end of the week and back to work as soon as possible. His recurrence-rate was, he said, about 4 to 5 per cent.

Mr. PHILIP TURNER (London) said that while it was important to remove the sac, it was almost as important to close the opening in the fascia through which the sac made its way. He described his operation for curing large hernias in elderly patients. He advocated the principle of plastic surgery, the replacing of tissues by like tissues. He said that the series of patients mentioned by Mr. Keynes now numbered about 100; all had been followed up, and the recurrence-rate was very small. The result showed that, if the patient's general condition was fairly satisfactory, it was possible to operate successfully on a hernia of almost any size at practically any age. In many cases a testis and the spermatic cord could be sacrificed with advantage. Herniorrhaphy was as effective in direct as in indirect hernia. Sliding hernias were more troublesome, but many could be treated satisfactorily in this way by cutting away redundant peritoneum, enlarging the opening in the retroperitoneal tissue, pushing back the large intestine, cutting a flap and pulling it over, and sewing up the opening in the transversalis fascia.

Mr. W. MCADAM ECCLES (London) spoke on his experiences 35 years ago with the City of London Truss Society. In those days operation on hernia was not nearly so common as to-day. Congenital hernia in young males should, he said, be operated on in the first few years of life or physical efficiency was in danger. A truss was not a nuisance if properly made and adjusted. Some elderly labourers were quite efficient and comfortable in trusses and were made worse by operation. Preparation and after-treatment were more important than the operation itself. The results would be better if asepsis were more rigidly observed. He recommended ten days in bed and ten days' progressive exercise about the ward. Hernia was compensated under statute as an industrial accident, and the patient should be tempted to do light work before heavy work.

Mr. R. WOOD POWER (Hereford) urged concentration on ventral hernia, which he said was by far the most difficult to operate on successfully. The muscle was lacking, and recurrence was high even after the Gallie graft. The graft must have no strain on it. He described a method of replacing the opening by a sliding graft from the rectus muscle.

Mr. P. H. MITCHINER (London) said that a workman could often carry on his work efficiently even if his hernia recurred. Ninety per cent. of policemen with recurrence were doing full duty without complaint. In the young man, where the inguinal ligament and conjoined tendons, together with the attached oblique and transversalis muscles, provided the mechanism for keeping the contents out of the sac, the hernia would only come down when tension on these muscles was prolonged. This strain should be removed rather by turning the end of the muscle into the scar than by an elaborate repair operation. His results showed 3 per cent. of patients with recurrence, quite a number of whom could work. Repair was necessary when tissues gave way, as in fat and elderly people. If the repair depended on scar tissue, the patient should stop in bed at least three weeks. A well-fitting abdominal belt was the best treatment of recurrence.

Dr. JOHN RAMSAY (Australia) spoke of the value of kangaroo tendon. He said that sufficient use was not made of the spare fascia, which could be rolled and folded up; if this were not sufficient, a flap could be turned off the anterior rectal sheath. Potential pouches off the posterior wall of the inguinal canal could become sacs if the peritoneum were not made smooth at the operation.

Mr. R. KENNON (Liverpool) declared that, though he might be riding for a fall, he was not at all depressed about his results, which showed some 3 per cent. of recurrence. Femoral hernia was the commonest variety in women. The direct hernia was the most difficult to deal with, and it was therefore unwise to weaken the area with scar tissue.

Prof. A. W. SHEEN (Cardiff) stressed the opinion that hernia operations should only be performed by comparatively experienced surgeons. He recalled a visit from the great French surgeon, Lucas-Championnière, who had insisted on strict asepsis. This authority had divided a small part of the internal oblique muscle and had made his way to the extreme top of the sac, and had left the peritoneum smooth, displacing the neck if he wished. The filigree was valuable when good, but highly detrimental when bad; its chief use was for large inguinal hernias and, when properly applied, for umbilical ruptures.

Mr. R. B. BLAIR (Hull) said that recurrences among dock labourers were very few. He advised light work after six weeks and ordinary work after six months.

Mr. A. B. ROOKE (Bournemouth) said that he hesitated to advise operation if there were a chronic cough. Early movement was not always harmful. When abdominal muscles were infiltrated with fat and the fascia resembled butter, the patient's condition presented an almost insuperable obstacle.

The PRESIDENT reminded the meeting that results were judged by the working community, who pressed for operation in almost all circumstances. The results from applying present principles were sufficiently good to encourage surgeons to continue on the same lines. In considering results it was unfair to make no distinction between the older patients, with their changed tissues, and the younger. One-third of his patients with umbilical hernia had recurrence. It was not enough to be content with

an ex-patient's reply on his condition, for he was likely to overlook a recurrence; a competent examiner should see him. Operation should be advised, because if it were not done and if the hernia strangulated later, chances of relief were very remote. The true criterion of cure was absence of recurrence in later life, when the tissues deteriorated.

SECTION OF RADIOLOGY AND ELECTROTHERAPEUTICS

Dr. D. D. MALPAS (Boscombe), vice-president, took the chair at a meeting of this section at which a paper on

Radiology as an Aid to the General Practitioner

was read by Dr. DOUGLAS WEBSTER (London), the president. Radiologists, Dr. Webster believed, would become more useful to their colleagues and the community when they regarded themselves primarily as physicians. The value of a diagnostic method depended on the light it could throw on obscure clinical problems, and especially on its ability to provide pathognomonic signs. Radiology had brought forward a greater number of such signs than all the previous centuries of clinical observation. Instances of these were bronchiectatic cavities, horizontal fluid levels, and gastric ulcer craters. Radiotherapy had also made immense advances and new discoveries were being made almost yearly, especially in the field of inflammatory infections. X rays and radium were the only agents known to have an influence on malignant growths. The first criterion of the value of radiology was that it must be good. There had been far too much imperfect radiology: hundreds of military recruits, for instance, had been rejected for a non-existent "peribronchial phthisis." Haenisch had recently held that the problems of correct interpretation were so great that there could be no "minor roentgenology" corresponding to "minor surgery" or "minor pathology." Dr. Webster, on the other hand, maintained that nearly all fractures and dislocations, many foreign body localisations, and much of the fields of elementary thoracic and genito-urinary diagnosis could be called minor roentgenology. If no distinction were to be made, he asked, how would it be possible to prevent technical assistants, radiographers, or general practitioners from practising radiology to a greater or lesser degree? Granted that interpretation was a medical prerogative, technical and elementary diagnostic radiology could not be restricted to medical specialists. On the other hand, there could be very little minor radiotherapy except in connexion with certain skin diseases. He considered that unqualified practice in radiology should be forbidden by law, just as the prescription and administration of drugs were forbidden.

Radiology had recently, he said, been recognised as a specialty by the institution of diplomas and by the insistence on the training in it of students. Dr. Webster laid stress on the need for a reasonably full and precise training of students; if the curriculum was over-burdened, he argued, much of what was unnecessary in it should be excised to make room. Unless the achievements of radiology were so exhibited as to make a wide appeal to the general practitioners of each country its diagnostic and curative possibilities would largely remain as locked-up capital. Private practitioners had the unique position of being the first to see most of the patients. They were thus able to advise medical, surgical, or other specialist treatment. Their coöperation must be solicited if the general level of health were to benefit by new knowledge. Much delay in diagnosis was due to ignorance of the possibilities of radiology. Some patients suffered for years from undiagnosed gastric symptoms and others spent years of ill-health with Graves's disease, leukæmia, and menorrhagia before radiotherapy was adopted. The most important sphere in which the coöperation of the general practitioner was essential was in the early diagnosis and treatment of cancer. Many patients were already at an inoperable stage at diagnosis, and many others were not good operative risks or were unwilling to submit to operation. The possibilities of radiotherapy should therefore be widely known. The first treatment was the all-important treatment, and it was quite indefensible to delay an appeal to the radiotherapist until surgery had proved a failure. Active campaigns in radiology had resulted in Sweden in a material raising of the general public health. A similar campaign in this country would have equal value.

Dr. E. KAYE LE FLEMING (Wimborne) set out the point of view of a general practitioner who regarded all kinds of specialist treatment as primarily arising from the needs of the general physician and closely associated with and dependent upon his interest and coöperation. The relationship of the general practitioner with the radiologist was not so close as with the surgeon, but was more intimate than with specialists, such as the bacteriologist or pathologist, who gave their reports in writing. He advocated a closer personal contact, fearing that from the peculiar nature of radiology there was a danger of the tie becoming weakened or lost, to the disadvantage of all concerned. The science of radiology, especially radiotherapy, was technically outside the sphere of knowledge of the general practitioner. Its application was advancing so rapidly that the busy practitioner could not keep pace with it. It was, moreover, an expensive specialty, and unless the practitioner had good knowledge of the nature of a treatment and its probable efficacy he must hesitate to recommend it.

He then enumerated the main departments in which the general practitioner found the radiologist's help of particular value: bone injuries and displacements, the thorax, and the abdomen. X rays gave great assistance in locating fluid in the pleural cavity, and the skiagram of the heart, especially with a fixed method of procedure, added appreciably to the physician's knowledge. Records of the bismuth meal examination were sometimes too expensive, and a series of drawings from screening, with regional photographs, would often be sufficient. In treatment, he asked for information on the possibilities of X rays in Graves's disease. The general practitioner, he said, was keenly interested in the production of sterility in the female, and wanted to be able to tell a patient what the treatment would entail in the way of time and money. It was always important for the practitioner to know the cost- and time-factors in specialist treatment. He asked whether radiologists viewed with disquiet the giving of radiation to prevent conception on the request of a practitioner of repute. He himself had never in his professional experience felt the need of any amendment of the law in relation to sterilisation and abortion. Practitioners well knew the success of radiology in malignant skin disease, but were less familiar with its value in other conditions. He asked how far he could rely on a speedy cure of multiple warts on the

hands or of patches of psoriasis. At present the treatment of carcinoma of the breast involved much cost and time; nevertheless, Dr. Le Fleming hoped that radium would some day displace the knife and greatly lessen the need for subsequent X ray exposure. In conclusion, he pressed for closer coöperation among radiologists in order to harvest their common experiences and results, and for a more systematic presentation of these results to the general practitioner, more particularly in post-graduate studies.

Dr. FRANKLIN WOOD (London) spoke on a series of 678 cases referred for X ray examination last year by the general practitioners of a certain area. They represented roughly, he said, the proportion of cases of the given types which required X ray examination in an average practice. Fractures came first with 388, and chest conditions came second; after these in order were arthritis, dental disorders, urinary disorders, and barium meal examinations. Pain, he said, was not always referred to the fracture, and diagnosis of cranial fractures required special skill. The radiogram would show every alteration in the heart and lungs. The condition of "radiological pneumonia" consisted of areas of congestion or consolidation and was seen after influenza; it corresponded to no physical signs or symptoms. Emphysema produced widening and asthma narrowing of the bronchi. He deprecated the use of softer rays in chest work, showing how the shadows of the heart and diaphragm obscured a large area of the lungs and blurred the apices. In pregnancy it was easy to make out the contour and diameter of the inlet and the character of the fœtus. He described methods of radiopelvimetry. In pseudo-pregnancy, he said, a radiogram of the abdomen gave useful reassurance. Lipiodol was valuable not only in the diagnosis of sterility due to obstruction of the tubes but also in its treatment; five patients out of eight treated had since become pregnant. Only the general practitioner could help the radiologist to see the late results of cases and therefore to correlate the clinical and the radiological findings.

Dr. H. G. DAIN (Birmingham) said that except in gross lesions radiology could not be expected to give the whole diagnosis. The young doctor was apt to leave out the clinical examination. Radiology was most often useful for settling the general practitioner's doubts of his diagnosis, and often saved a second operation. When referring patients, the general practitioner should give the radiologist an idea of his difficulty, and in return the radiologist's report would be enlightened by this clinical knowledge. The chief uses of radiology were first of all its protective legal use to the general practitioner. Unfortunately no doctor was safe until the patient had been radiologically examined, though many of such examinations were clinically needless. Secondly, an enormous proportion of sprained ankles and wrists were really fractures. Here, although the X ray findings might not modify the treatment, they would affect the prognosis. Thirdly, X rays enabled the practitioner to watch the progress and healing of arthritic or tuberculous joints. In the fourth place, radiology was valuable for detecting infected foci; it had saved the removal of many teeth and was not, as some believed, a means of having teeth extracted. It gave a much more accurate idea of the patient's chances in a chest case, and with the new contrast media its use in the diagnosis of gall-bladder and kidney complaints was increasing. Difficulties in technique constituted one of the main drawbacks, and among the chief of these was variation in the angle at which the film was taken. In treatment one of its most outstanding successes was in ringworm. He was not satisfied with its value in Graves's disease, but deep therapy was effective in many malignant conditions. After mammary excision its results were disappointing.

Dr. W. B. PROWSE (Brighton) said that the radiologist relied on the general practitioner to educate patients to appreciate the proper position of radiology and of the radiologist as consultant. The radiologist was a medical man practising in a technical field, not a technician. It was a misfortune that radiology dealt largely in pictures, the value of which in the public eye overshadowed that of the radiologist's intelligence. Patients were apt to consider the picture the chief part of their money's worth, as something which they could take to another doctor or osteopath. The radiologist's fees were not high compared with those of other specialists. More films of barium meal examinations were necessary, and they could not be replaced by screen drawings. In disagreement with Dr. Le Fleming he considered that radiological evidence was often useful in appendix cases. In deciding on treatment, the course should be adapted to the patient. The general practitioner should place all reliable data in the hands of the radiologist, preferably by interview.

Dr. ANDREW BAXTER (Alderley Edge, Cheshire) said that he always endeavoured to be present at the consultation with the radiologist. In his experience, post-operative radiotherapy in breast cancer saved the patient from secondary trouble. Radiology might save operation, as in intestinal obstruction in an old person where malignancy was suspected, but did not exist. He agreed with the full instruction of students, saying that the more a general practitioner knew of a specialty the more likely he was to consult a specialist. He urged a campaign in connexion with post-graduate work.

Dr. G. B. BATTEN (Dulwich) pointed out that a radiologist learnt to interpret only by long personal experience and experiment, and by following up patients to operation and autopsy. Dr. Stanley Melville had added much to radiological knowledge by attending the post-mortem examination of all patients who had died after examination for chest disease. Knowledge of the technique of radiology was, however, useless and dangerous in the hands of students and did harm by making them think of radiologists not as physicians and surgeons but as picture-takers. The general practitioner who purchased an X ray outfit was likely to become a menace to his patients.

Dr. J. F. BRAILSFORD (Birmingham) held that the student should be taught what the radiograms meant. This would enable him to appreciate the nature of living organs as he could not by other means. There was no objection to the medically unqualified radiologist, who kept his job because he turned out first-class work. Radiotherapy could be extremely valuable in some cases of Graves's disease: patients might occasionally be burnt on the neck, but they were at any rate alive. It was impossible to cut down expense by limiting the examination, for scanty examination meant misdiagnosis. Contract work was apt to lead to mistaken economy in this direction. Clinical examination was becoming neglected. A negative report of a first examination did not necessarily mean that the patient was healthy. When the radiological appearances were typical in the absence of clinical signs, the general practitioner could not afford to neglect them.

Dr. ROY WARD (London) said that as early diagnosis was the most important single factor in the treatment of cancer, progress would be limited until there was a closer liaison between the patient, the doctor, and the treatment centre. At present patients failed to come for examination through ignorance or because they were afraid of cancer being diagnosed. The general practitioner must help centres to follow up their patients. The use of radiotherapy in menorrhagia was not dependent on a gross lesion. Operation was better than X rays for sterilisation, as it saved the ovaries. The choice of treatment in early operable cases of breast cancer had not yet been put on a satisfactory basis. For the thin, flat breast radiotherapy was better than surgery, but in the fat, pendulous breast it was difficult to distribute the needles properly and operation had advantages, especially if the incision were made over a wide area of skin.

Dr. C. H. C. DALTON (Ipswich) said that students should be instructed in what radiology could do. If instruction were deferred until the post-graduate stage, the great majority would not receive it. Every radiologist ought to serve at least one year as a resident before he took the diploma.

Dr. S. L. MUCKLOW (Cheltenham) suggested as one advantage of an interview between general practitioner and radiologist that analogies were often suggested with former cases.

Dr. LE FLEMING, in reply, said that one great use of an X ray film was to impress the patient with the need for proper treatment. A disadvantage of post-operative radiation was that it concentrated the patient's mind on the possibility of recurrence.

Dr. WEBSTER, also in reply, advised radiologists not to base their reports on the screening, because the film often showed appearances that the screen missed. This was especially true of fractures, where the legal danger came in. Modern safety apparatus, in which the current could not be passed until the filter was inserted, abolished danger to the skin. A new method was being perfected by which Graves's disease might be cured in a few weeks. The radiologist and the general practitioner could coöperate usefully in periodical medical examination for preventive purposes.

SECTION OF PUBLIC HEALTH

THE president of the section, Dr. T. CARNWATH (Ministry of Health), having briefly introduced the speakers, Dr. R. A. O'BRIEN (Beckenham) opened a discussion on

Immunisation in the Prevention of the Specific Fevers

in a paper dealing mainly with recent advances in the production of diphtheria prophylactics. The original toxin-antitoxin or toxoid-antitoxin mixtures with which so much of the earlier work was carried out were, he said, with the exception of toxoid-antitoxin floccules (T.A.F.)—a potent prophylactic which does not give rise to reactions—gradually being replaced by toxoid. Considerable use is also being made of alum-toxoid. Toxoid given in three or even two well-spaced doses has been found to make well over 90 per cent. of Schick-positive reactors negative within a few weeks. Except in very young children toxoid is apt to give rise to local reactions. Various ways may be adopted to circumvent these. Some give a full dose of 1 c.cm. of toxoid to children under 5 years of age. In the case of older children, the Moloney-Fraser intradermal sensitivity test with diluted toxoid is applied; negative reactors are immunised with full doses of toxoid, positive reactors with T.A.F. The so-called universal dose of toxoid (0·1 or 0·05 c.cm.) may be given to all children. Dr. G. Chesney of Poole injects all children with a small detector dose to identify those likely to suffer reactions. Discussing alum-toxoid, which although a powerful antigen tends to produce lumps and on occasion sterile abscesses at the site of injection, Dr. O'Brien said he was not wholly convinced that it will displace formol-toxoid. He thought however that, until it was possible to eliminate the pseudo element from antigens, the local swelling and general malaise which may follow the inoculation in sensitive people would not entirely disappear. There was no evidence that prophylactics made from the classical Park-Williams 8-strain did not give adequate protection against infection with the *gravis* strain of *C. diphtheriæ*.

Contrary to Dudley's experience at Greenwich, Dr. O'Brien had been unable to collect evidence in this country, or in the United States of America, that immunisation produced an increased carrier rate amongst the immunised who might therefore constitute a danger to non-immunes. About immunisation against scarlet fever there was little or nothing new to report. Scarlet fever formol-toxoids had been produced, he said, but, unfortunately, as the intensity of formalinisation is increased the toxicity is reduced and so also the immunising efficiency. Work was still being carried out but, so far, a satisfactory scarlet fever toxoid was not available. In the vaccine prophylaxis of whooping-cough, Dr. O'Brien considered that the work of Madsen in Scandinavia and Sauer in America offered considerable hope. He concluded by stressing the difficulties of the immunologist in obtaining access to adequate clinical material. Progress would be faster, he said, if under proper safeguards trial could be made of different antigens on large groups of children.

Surgeon-Captain S. F. DUDLEY, R.N. (Chatham), said that in his experience at Greenwich Hospital School negative Schick reactors might lapse to the extent of 10 per cent. in from six months to two years. Infection with the diphtheria bacillus, however, rapidly raised the antitoxic titre of the blood so that most of the cases of sore-throat in lapsed immunes were so trivial as to be clinically unrecognisable as diphtheria. He insisted upon the importance of not claiming that a school population was immune until there was evidence that the Schick tests had become negative. There could be no greater set-back to the progress of immunisation, he remarked, than the occurrence of severe or fatal diphtheria amongst those who were alleged to be immune. Since carriers were Schick-negative reactors, artificial active immunisation increased the number of those who, instead of developing clinical diphtheria following infection, became carriers. Captain Dudley believed that absolute immunity was not attainable, but active immunisation reduced morbidity, even following *gravis* infections, to a negligible figure. In conclusion he referred to recent important work by Colonel M. Perry and his co-workers at the R.A.M.C. College on T.A.B. vaccine. The Rawlings (1900) strain of *B. typhosus* had, with the lapse of years, lost virulence. It had now been possible to rejuvenate the strain and it had further been shown that vaccines prepared from virulent strains were no more likely to give rise to reactions following inoculation than were strains possessing only a low degree of virulence.

ULTRAMICROSCOPIC VIRUSES

Dr. WILSON SMITH (Med. Research Inst., Hampstead) discussed the methods of immunisation available for those specific fevers which are caused by ultramicroscopic viruses. An acceptable method must be absolutely safe and produce no disturbance of health. It should be painless and result in a high grade of lasting immunity. There were several difficulties. No virus was known to produce an exotoxin, and thus those controlled trials with neutral innocuous toxin-antitoxin mixtures which were possible in the case of diphtheria were not feasible. Since viruses could not be grown upon lifeless media, pure sterile suspensions of known density, like T.A.B. vaccine, could not be made. Virus vaccines contained a little virus and a great deal of something else which might reduce, if it did not destroy completely, the efficiency of the vaccine. Owing to their very small size, it might be quite impossible to administer enough bulk of the dead virus to produce an adequate immunological response and, further, in the case of certain human diseases no other animal species had been found susceptible to infection by the causative virus. Nevertheless, important advances had been made during the last few years by indirect methods. Killed virus vaccines might produce no immunity or immunity which was slight and transient. The latter might be converted into solid immunity by giving subsequent doses of the living virus, possibly fatal to the normal animal. Formolised and carbolised vaccines had been extensively used for dog distemper and cattle plague and in human rabies were employed with great success. Field trials of similarly prepared yellow fever vaccine during an epidemic were unconvincing. These vaccines were unstable and might also be rendered quite useless if the viricidal chemicals were added in too great a concentration. Methods valid for one virus might be invalid for another.

In some cases, Dr. Smith thought, really killed viruses might be antigenically active and improved methods of concentration and purification might lead to their greatly extended use. By passage of the living virus through an unusual host it might be so modified as to produce in the human being a mild disease —e.g., vaccinia—but the modified virus was not sterile and hence scarification, even with its lack of precise dosage, was the only advisable means of administration. T. M. Rivers had cultured vaccinia virus in chicken embryo medium and had produced a satisfactory degree of immunity in 100 out of 118 infants. Culture vaccine might be injected intradermally without disadvantage. Further, W. D. H. Stevenson and G. G. Butler (THE LANCET, 1933, ii., 228) had produced, he said, a highly potent and sterile vaccine by growing the virus on the chorio-allantoic membrane of the developing chick embryo. One egg would yield sufficient virus for the vaccination of 200 individuals. M. Theiler by the intracerebral inoculation of mice had prepared a modified strain of yellow fever virus which had been used for the inoculation of human beings. In this disease Dr. Smith thought it was preferable to adopt the method employed so extensively in animal diseases, such as dog distemper—i.e., the combination of virus with immune serum. The attack of yellow fever resulting from the injection of mouse-brain virus and convalescent serum together is mild, and extensive trials have shown that the immunising response is satisfactory. Dr. Smith mentioned briefly the use of convalescent serum in the prophylaxis of measles and its possibilities in poliomyelitis, chicken-pox, and mumps.

Dr. E. H. R. HARRIES (North Eastern Hospital) described some of the main indications for active and passive immunisation in the practice of the fever hospital. It was essential to immunise the staff against small-pox, diphtheria, scarlet fever, and, on occasion, against infections of the enteric group. Natural Schick-immune or lapsed artificially immunised nurses never, following infection with the diphtheria bacillus, experienced more than a highly modified and trivial attack which cleared up spontaneously. Immunisation of nurses with toxoid was valid against *gravis* infections. Natural Dick-immunes possessed solid immunity and did not contract clinical scarlet fever. Occasionally, artificial Dick-immunes appeared to lose immunity to an extent which permitted a clinical attack of the disease. Until the optimum range of skin test doses was known, active immunisation against scarlet fever in public schools with their high proportion of original Dick-positive reactors who might relapse could not be advised. Dr. Harries showed that the active immunisation of nurses against scarlet fever did not increase the incidence of streptococcal tonsillitis among them. Prophylactic *passive* immunisation against diphtheria, scarlet fever, and measles was of great value in obviating the spread of cross-infection in fever hospital wards. During the recent measles epidemic, when it was essential to maintain the maximum turnover, Dr. Harries had, by the injection on admission of a combined prophylactic of diphtheria and scarlet fever antitoxins contained in 5 c.cm. of concentrated serum, been able to secure the almost complete freedom of measles wards from these cross-infections. Analysis of some 900 consecutive cases so protected showed no instance of anaphylaxis and a late serum rash rate in about 9 per cent. It was further shown that sensitisation was negligible in frequency and degree. He discussed the value and dosage of adult immune measles serum.

Dr. C. W. HUTT (Holborn) gave statistical details of the progress of diphtheria immunisation in the large cities, headed by Birmingham with some 70,000 immunised children.

Dr. E. H. T. NASH reported the further progress of his immunisation campaign in Heston and Isleworth. He stressed the importance of propaganda.

Dr. NANCY HOWELL (Acton) had, during the last 18 months, immunised 6000 school-children including 69 per cent. of those in infants' departments. No cases of diphtheria had been admitted to hospital for some time. A gratifying result of a local anti-vivisectionist campaign had been a large immediate accession of children to the immunisation clinics.

Modern Sanatorium Treatment

In a paper read in his absence Dr. A. S. MACNALTY (Ministry of Health) insisted upon the importance of early diagnosis and the proper selection of patients for sanatorium treatment. He noted a tendency to disparage sanatorium treatment and to exalt collapse therapy. There should be full coördination between the tuberculosis officer and the medical superintendent. Facilities for observation and hospital treatment were essential. Collapse therapy should only be carried out in really suitable cases. The criterion of temperature was all-important. Fever was the first indication of infection and should be met by absolute rest in hospital. Correct coördination between the hospital and sanatorium would obviate the admission of unsuitable cases to sanatoria. With the recurrence of activity the sanatorium patient should return to hospital. Careful study of the individual patient was

essential. There must be a proper régime and facilities for prolonged stay. After discharge the ex-sanatorium patient should be secured as regards maintenance and should be kept under supervision for five years. Village settlements met these requirements.

Dr. F. G. CHANDLER (London) and other speakers also advised caution in the selection of cases for collapse therapy. It should not be lightly undertaken. The tuberculin era was recalled and fears expressed that another valuable mode of therapy might fall into disrepute as a result of indiscriminate use.

UNITED STATES OF AMERICA

(FROM AN OCCASIONAL CORRESPONDENT)

A NOTABLE HEALTH SURVEY

A RECENTLY completed health survey of the State of New Mexico is of unusual interest from two points of view. In the first place, something over one-half of the population of this State consists of "Spanish-Americans"—the original Indian population interbred with Spanish conquistadores. The U.S. Census Bureau classifies them as white Americans, so that it is impossible from the mortality statistics published in Washington to distinguish between the rates for Spanish-Americans and for their "Anglo-American" neighbours. The New Mexico survey is the first extensive study of health among these original inhabitants of the south-west. In the second place, New Mexico has been for a generation the mecca of the American consumptive. Thousands have travelled from all parts of the United States to seek health among the New Mexico mountains. Many have died there leaving their families in the State. Many have recovered complete health and are now prominent bankers, lawyers, physicians, and merchants of the State. What has been the effect of this influx of active cases of tuberculosis upon the indigenous population? These interesting aspects of New Mexico's health problems, together with the fact that the bureau of public health in this State is administered on a civil service basis and is therefore reasonably efficient, induced many of the national health organisations to participate with the New Mexico Tuberculosis Association in the study.

The survey was made under the general direction of Dr. Carl Buck, field director of the American Public Health Association. It covered 18 out of 31 counties. Most of the work, however, was done in five counties carefully selected to include the different racial and occupational groups to be found in the State. In all, 4755 school-children received Mantoux tests, 4076 were examined for nutritional defect by the new A.C.H. method, 4000 had their eyes examined by experts from the National Society for the Prevention of Blindness. A careful search was made amongst the adult contacts of children giving positive Mantoux tests for open cases of tuberculosis. This was in addition to health examinations given at random in the adult population. More than 5000 adults selected at random had blood samples taken for Wassermann and Kahn tests, and in some cases for further serological study. More than 7000 premises were studied for sanitary facilities.

Mora County, populated almost entirely by Spanish-Americans, provided 1646 specimens of blood of which 1023 were from adults. The rate of syphilis among adults was found to be 8·0 per cent. The rate among children (under 17 years of age) was 2·0 per cent. No difficulty was experienced in tracing possible sources of infection. The cases found positive seemed not to be disturbed either that they had acquired the infection nor at the implications of having acquired it. An interesting account of this part of the survey has been published by Dr. Walter Clarke (Ann. Internal Med., May, 1934).

It is estimated that there are not less than 20,000 cases of active syphilis in the State. An accurate census, taken by the U.S. Public Health Service, of all cases of syphilis under treatment by the doctors and institutions of the State on Dec. 1st, 1933, showed 1011 cases actually under treatment. From this it follows that only 1 out of every 20 cases of syphilis in the State is under medical treatment. Judging from the findings in Mora County and from other available data, it is probable that the proportion of Spanish-Americans receiving treatment is even much less than the 1 in 20 average for the State.

Of adults examined at random, 8·6 per cent. were diagnosed either as having active tuberculosis or as suspicious. Among the families whose adult members were given physical examinations and found to be free from tuberculosis, 12·8 per cent. of the children gave positive Mantoux tests. On the other hand, in families in which active tuberculosis was found, 32 per cent. of the children gave positive reactions. Since tuberculosis was found to be three times as common among the Anglo-Americans as among the Spanish-Americans, one might easily suppose that more Anglo than Spanish children would show positive Mantoux tests. Remarkably this was not the case. The Anglo-American group of children showed 13·2 per cent. Mantoux positive, the Spanish-American 22·9 per cent. From this it appears that while the existence of open cases of tuberculosis in the family is an important factor in the spread of infection there must also be other factors of even greater social import. Will these other factors, whatever they are, also tend eventually to produce a large number of active cases among the Spanish-speaking people?

Public health officers in the south-west will watch with interest the research now being pursued in Cattarangus County, N.Y., where 500 children (300 reactors, 200 non-reactors) have been under close observation for a total of 1742 person-years. About half of the reactors have been followed into adolescence. Five of them are now negative to tuberculin. Only three have developed adult tuberculosis, two of them after continued or renewed exposure to positive sputum in the home, and the third after strenuous competitive athletic sports.

The survey of the sanitation of homes in New Mexico discloses primitive methods of waste disposal and water-supply among the Spanish-speaking people. Ninety per cent. rely on outdoor privies, while 4·2 per cent. have no system of human waste disposal at all. The Anglo-Americans enjoy only slightly better conditions, 71 per cent. using outdoor privies, while 15·9 per cent. have sewer connexions. Less than 10 per cent. of the privies in either group were found to be flyproof. In 15 per cent. of the premises surveyed (9 per cent. Anglo, 27 per cent. Spanish) there was a cesspool or privy, usually the latter, within 50 feet of the source of drinking water. Five per cent. of the Anglo-Americans and nearly 10 per cent. of the Spanish-Americans get their drinking water from streams or from irrigation ditches.

PARIS

(FROM OUR OWN CORRESPONDENT)

OF WHAT DO PARISIANS DIE?

"OUR study presents, in brief, a promenade through a vast cemetery harbouring numberless Parisians who have disappeared during the three five-year periods, between 1909 and 1923." With this pictorial introduction, Dr. G. Ichok begins an analysis in the *Annales d'hygiène publique* of the main causes of death in Paris over three periods of equal length before, during, and after the war. As the population of Paris has shown little tendency to expand in the period under review, Dr. Ichok's uncorrected figures give a truthful enough picture of the relative importance of the various causes. It should be noted that the present tendency of many French doctors not to notify explicitly the causes of the deaths of their patients is hardly at all reflected in the present study which deals with Paris alone and with a period when ignorance had not yet become a studied policy. In fact, among a total of 672,137 deaths registered between 1909 and 1923 there were only 4917 not specified. Old age as a cause of death has increased slightly, but what is truly remarkable is the fact that there are three women for every man dying of old age. For this sex inequality Dr. Ichok has no explanation. Turning to deaths from suicide, he publishes a table in which nine variations of suicide are classified. The years 1914–18 distracted the would-be suicide, and the diminution survived the war. But there is one exception—viz., suicide by drowning—for which the figures for the three periods are 152, 108, and 305 respectively. On the other hand, accidental drowning is about 50 per cent. less common after 1919 than it was both before and during the war. Dr. Ichok is inclined to explain this paradox by assuming that many a suicide by drowning before and during the war was glossed over with the diagnosis *submersion accidentelle*. As for tuberculosis as a cause of death, we find the paradox of tuberculosis of the lungs declining from about 47,000 to about 33,000, while tuberculosis of the larynx shows a rise from 585 to 697 in the period under review. These opposite movements probably reflect fashions in notifications rather than any basic change in the behaviour of tuberculosis in these two organs; and it would be getting nearer to the truth if the larynx were not dissociated from the lungs. With regard to the digestive system as the seat of fatal disease, it is noteworthy that the deaths from ulcer of the stomach numbered 354, 454, and 736 respectively in the three periods. In compensation for this abrupt rise is the diabetic mortality, the figures for which are 2312, 1846, and 1563 respectively.

MEDICAL PLETHORA AND A PROPOSED REMEDY

Dr. Portmann, senator and professor of medicine, has suggested a scheme for relieving congestion in the medical profession by the simple expedient of limiting the number of entrants. He has even prepared a draft of a law to this effect. According to the first article the Minister of Education will decide each year how many medical students may register as such, and how many may proceed from the first to the second year of their studies. According to the second article, the would-be medical student's inclusion in, or exclusion from, the list of candidates for a medical career would depend on the number of marks scored in certain examinations. They would, in other words, become competitive. In the *Concours médical* Dr. G. Duchesne deplores his colleague's lack of historical sense. For 50 years or more French doctors have not ceased to bewail the discomforts of a competition thrust on them by the overcrowding of the profession. In 1899 a prize was offered by a leading French medical journal for the best essay on this problem and its solution. Though Dr. Duchesne did not win this prize, his essay was published by the journal in question in 1900. Looking over it again, after an interval of 34 years, Dr. Duchesne was struck by the similarity of his scheme of reform to that of Prof. Portmann. But in the interval, Dr. Duchesne has lost confidence in the wisdom of such short cuts by discriminatory legislation. How, he asks, would it be possible to ascertain what is the number of doctors that would be necessary and sufficient for the needs of the community? And how are doctors to be distributed in the many branches of their profession? And what would happen if the limited number of students allowed to qualify as doctors were all to choose to settle in Paris, to the neglect of the rest of the country? Nothing less than an arbitrary geographical distribution of doctors would solve this difficulty, a pretty solution indeed for a liberal profession!

SYSTEMATIC MEDICAL SUPERVISION OF MEDICAL STUDENTS AND NURSES

The extension of the system of periodical medical examinations to medical students and nurses is yielding instructive and sometimes disconcerting results. They are curiously similar, whether the examinations have been made in Yale, Oslo, Upsala, or Munich. At the Boucicaut Hospital in Paris, in the course of the past eight years, Dr. Courcoux and his colleagues have thoroughly overhauled more than 300 students and 380 nurses. A radioscopic examination of the lungs and heart was supplemented by a radiographic examination when there was any suspicion of tubercle. This comb-out not only yielded a couple of cases with tubercle bacilli demonstrable in the sputum, but also several cases of old pleurisy and radiologically demonstrable morbid changes in the lungs. The danger of the former to their neighbours, and the need for both groups to take special care of themselves, require no emphasis. But a more surprising result of these systematic examinations was the observation from time to time that the apparently robust, who passed the first examination with flying colours, collapsed soon afterwards with signs of acute tuberculosis. The by now classical skin tests of Hamburger and Monti in Vienna at one time lulled the world into a false sense of security with regard to the immunity of young adults to tuberculosis by their finding that 94 per cent. of the Viennese children between 11 and 14 were already tuberculin-positive. Dr. Courcoux and his colleagues have checked up these figures by tuberculin skin tests which they have included in their medical examinations of students and nurses during the past two years. They found that 23 per cent. of the students and 21 per cent. of the nurses were still cuti-negative. Yet most of these negative reactors came from urban, not rural homes. The precaution was taken of enjoining on these presumably susceptible persons the necessity for beginning their hospital work in services in which exposure to tuberculous infection would be least likely, but the repetition of the medical examinations, including skin tests, not only showed that more than half of them soon became cuti-positive, but also that several of them

showed other and more disquieting signs of a recent infection. Commenting on these observations at a meeting of the *Société d'études scientifiques sur la tuberculose*, Prof. Bezançon stressed their importance in favour of the conception of tuberculosis as a contagious disease, at a time when there is a return on the part of many to Villemin's belief in tuberculosis as an expression of heredity.

IRELAND

(FROM OUR OWN CORRESPONDENT)

A NEW PUBLIC HEALTH MEASURE

IMMEDIATELY before the adjournment of the Dáil the Minister for Local Government and Public Health introduced a Local Government (Amendment) Bill, the text of which has now been circulated. It contains provisions which empower the Minister to divide rural sanitary districts into two or more sanitary districts, each of which will rank as a county health district. The Minister will only take such action at the request of the county council. The county council will continue as the sanitary authority of each newly constituted district. Pending a statement from the Minister on the second reading of the measure its objects are not clear. Few of the counties in the Irish Free State are too large to be dealt with as a single area, and a multiplication of small sanitary districts may lead to unnecessary duplication of machinery. At present only two-thirds of the county areas in the State have medical officers of health, and a multiplication of areas is likely to delay still further this essential step in administration.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED AUGUST 25TH, 1934

Notifications.—The following cases of infectious disease were notified during the week: Small-pox, 0; scarlet fever, 1964; diphtheria, 967; enteric fever, 51; acute pneumonia (primary or influenzal), 368; puerperal fever, 43; puerperal pyrexia, 116; cerebro-spinal fever, 15; acute poliomyelitis, 34; acute polio-encephalitis, 2; encephalitis lethargica, 6; dysentery, 5; ophthalmia neonatorum, 81. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on Sept. 3rd–4th was as follows: Small-pox, 0; scarlet fever, 1158; diphtheria, 1409; measles, 353; whooping-cough, 275; puerperal fever, 19 mothers (plus 7 babies); encephalitis lethargica, 269; poliomyelitis, 5; "other diseases," 270. At St. Margaret's Hospital there were 18 babies (plus 5 mothers) with ophthalmia neonatorum.

Deaths.—In 121 great towns, including London, there was no death from small-pox, 3 (1) from enteric fever, 9 (1) from measles, 5 (0) from scarlet fever, 9 (1) from whooping-cough, 24 (3) from diphtheria, 54 (14) from diarrhœa and enteritis under two years, and 11 (0) from influenza.

The deaths reported during the week as due to diphtheria exceed the sum of those due to measles, scarlet fever, and whooping-cough. The fatal cases of diphtheria were widely distributed, no more than 2 being reported from any great town, but Portsmouth, Liverpool, Newcastle-on-Tyne, Sheffield, and Birmingham each reported 2 deaths. The two fatal cases of enteric fever outside London occurred at Hull. Birmingham, with 6, showed the highest deaths from diarrhœa, Leeds following with 5, Liverpool and Newcastle-on-Tyne with 3.

The number of stillbirths notified during the week was 249 (corresponding to a rate of 38 per 1000 total births), including 34 in London.

THE SERVICES

ROYAL NAVAL MEDICAL SERVICE

Surg. Comdrs. G. E. D. Ellis to *Victory* for R.N.B. and H. L. Douglas to *Pembroke* for R.N.B.

Surg. Lt.-Comdrs. E. B. Pollard, J. C. Souter, J. W. Cussen, R. G. Anthony, D. C. Drake, E. J. K. Weeks, and A. A. Pomfret to *President* for course; C. Keating to *Pembroke* for R.N.B., and to *President* for course; C. H. Birt to *Pembroke* for R.N. Hospital, Chatham, for course; W. F. Walsh to *St. Angelo*; T. W. Froggatt to *Godetia*; and J. C. Gent to *President* for course.

Surg. Lt.-Comdrs. (D.) L. B. Osborne to *Drake* for R.N.B. and A. W. Wallace to *Resource*.

Surg. Lts. B. S. Lewis to *Dolphin*; S. R. G. Pimm to *Victory* for Haslar Hospital for course; J. L. S. Coulter to *Centurion*; M. J. Brosman to *Fowey*; and S. R. G. Pimm to *President* for course.

Surg. Capt. P. E. Maitland, retired, has been awarded a Greenwich Hospital pension of £50 a year, from March 20th, in the vacancy created by the death of Fleet Surgeon R. H. Nicholson, retired.

Surg. Comdr. G. Kirker to *Drake* for R.M. Infirmary, Plymouth.

Surg. Lt.-Comdrs. (D.) H. E. Rose to *Defiance* and J. L. Edwards to *St. Angelo* for Malta Hospital.

Surg. Lt. D. B. Jack to *Bideford*.

ROYAL NAVAL VOLUNTEER RESERVE

Surg. Lt. H. A. M. Whitby to be Surg. Lt.-Comdr.

Surg. Lts. J. D. Simpson to *Vernon*; K. W. Martin to *Victory*; and W. D. M. Millar to *Victory* for R.N.B.

Proby. Surg. Sub.-Lts. D. Shute to *Pembroke*; P. M. Inman to *Effingham*; and J. Scott to *Drake* for R.N.B.

ROYAL ARMY MEDICAL CORPS

Lt.-Col. R. C. Hallowes, D.S.O., retires on ret. pay.

Maj. L. T. Poole, D.S.O., to be Lt.-Col.

Maj. L. A. B. Moore relinquishes his commn.

REGULAR ARMY RESERVE OF OFFICERS

The undermentioned, having attained the age limit of liability to recall, cease to belong to the Res. of Off.: Lt.-Col. L. G. Gibson, Lt.-Col. F. L. Bradish, D.S.O., and Lt.-Col. W. C. Smales, D.S.O.

ARMY DENTAL CORPS

Maj. R. M. King to be Lt.-Col.

TERRITORIAL ARMY

Maj. S. J. C. Holden to be Lt.-Col.

R. M. Allardyce to be Lt.

TERRITORIAL ARMY RESERVE OF OFFICERS

The King has been graciously pleased to confer the Efficiency Decoration upon the undermentioned Officers under the terms of Royal Warrant: Lt.-Col. C. H. Budd and Maj. V. H. Wardle.

ROYAL AIR FORCE

Dental Branch.—Flight-Lt. G. A. Ballantyne is promoted to the rank of Squadron Leader.

INDIAN MEDICAL SERVICE

The appt. of the undermentioned officers is confirmed: Captains: B. M. Rao, A. N. Duggal, B. S. Sandhu, B. N. Khan, I. Bakhsh, C. H. Dhala, M. Ata-Ullah, S. Ahmad, C. C. Kapila, and V. M. Albuquerque.

The undermentioned appts. are made: To be Lts. (on prob.): W. J. Virgin, J. Brebner, H. W. G. Staunton, and J. D. Gray.

The undermentioned officers have vacated appts. in India: D.A.D.M.S.: Maj. R. F. Walker.

The undermentioned appts. have been made in India: A.D.M.S.: Col. L. V. Thurston, D.S.O., Brit. Serv. and Col. A. E. S. Irvine, D.S.O., Brit. Serv.

DEATHS IN THE SERVICES

The death occurred at Dymchurch, Kent, on August 31st, of Lieut.-Colonel Alban Anderson Meaden, R.A.M.C. (retired). Born in 1876, he was the eldest son of the late Rev. R. A. Meaden, and was educated at Highgate, St. Bartholomew's Hospital, and London University. He qualified M.R.C.S. in 1902, gained the Lawrence gold medal and scholarship in 1903, and entered the R.A.M.C. in 1904. He served through the European War and was created D.S.O. in 1916. He retired in 1931.

The death occurred on Sept. 3rd at Bexhill of Colonel Alan Edmondson Tate, C.S.I., C.M.G., R.A.M.C. (retired). He was the son of the late Rev. C. R. Tate, Rector of Trent, Somerset. Born in 1859 and educated at Merchant Taylors' and Bishop Stortford Schools, he qualified M.R.C.S. and L.S.A. in 1882. He entered the R.A.M.C. in 1883, became colonel in 1912, and retired in 1917. He served with the Burma expedition, 1886–89 (medal with two clasps), with the Chitral relief force, 1895 (medal with clasp), and in the South African war, 1899–1901 (Queen's medal with six clasps). He served in Mesopotamia and India 1915–19 and received the C.M.G. in 1916, and in 1919 the C.S.I. He was on the staff of the commander-in-chief in India 1903–07 and hon. surgeon to the Viceroy of India 1912–17. He was also deputy assistant director-general of Army Medical Services at the War Office in 1908–09. He married in 1889 Zaidee, daughter of the late Mr. Frank White, of Loughborough.

CORRESPONDENCE

EXTRAPERITONEAL OVARIAN GRAFT CYST

To the Editor of THE LANCET

SIR,—In THE LANCET of July 14th (p. 74) Mr. J. S. Hall gave a very interesting account of cyst formation in ovarian grafts, and pointed out that very few cases have been recorded. Here is a recent case of my own.

Mrs. S., aged 36, was admitted to hospital on Dec. 21st, 1933, complaining of pain in the right iliac fossa, dysuria, frequent menorrhagia, and vomiting. She had had two previous operations, one in 1929 for dilation and curettage, the other in 1931 when the cervix was amputated. On examination the uterus was bulky and irregular, and there was a tumour in the pouch of Douglas. On Dec. 27th I opened the abdomen and found numerous adhesions surrounding an appendix which had been the seat of recent inflammation. The appendix was removed. The uterus contained a large number of fibromyomata, and there was an ovarian cyst on the right side the size of a grapefruit. The left ovary was also cystic. A panhysterectomy was performed, and three slices of the left ovary, each about 2 cm. long and 3 mm. thick, were transplanted into the rectus sheath on the right side. Convalescence was uneventful, and the patient was discharged on Jan. 20th.

I saw her again in February, when she complained of a painful swelling in the right rectus sheath. On Feb. 15th, under local anæsthesia, I removed one of the grafts. There was a small collection of blood-stained fluid about it, but no true cyst wall could be seen. The pathological report was: "The greater part of the transplant shows necrosis and loss of cell outline. There is a small area of proliferation of young blood-vessels into the centre, while the extreme edge of the tissue submitted appears to have escaped." On July 16th she complained of tenderness over two "lumps" in the right rectus sheath. They were about the size of pigeon's eggs, but she agreed not to have them removed when assured that they were not due to "cancer." She was entirely free from menopausal symptoms, but complained of some premenstrual pain over the tumours.

(I am indebted to Dr. R. A. Grant, medical superintendent of the Birkenhead Municipal Hospital, for permission to publish this case, and to Dr. J. M. Ritchie for the pathological report.)

The points of special interest are these: (1) The ovary from which the graft was taken was the seat of the disease. (2) Cyst formation occurred in all these pieces of graft. (3) There have been no menopausal symptoms. (4) The section showed, as is usual, some necrosis and new blood-vessel formation, but no definite cyst wall was seen. I believe, as Mr. Hall suggested, that these cysts are not true ovarian cysts but rather false cysts, the walls being formed by the surrounding tissue and the fluid by the rupture of Graafian follicles, the contents of which have not been absorbed. This theory is supported by the pathological findings, and it seems possible that the difference between the osmotic pressure of the liquor folliculi and the tissue fluids not only prevents the absorption of the liquor folliculi but may even cause an increase in the cyst contents. The fact that the ovary from which the grafts were taken was diseased does not affect the theory, and indeed it is probable that a diseased ovary is always used for transplantation, as otherwise the operation would not be required. It is, I think, unnecessary to remove these cysts unless the symptoms that they produce warrant it, and this is more especially so when menopausal symptoms have been avoided.

I am, Sir, yours faithfully,

H. A. KIDD, F.R.C.S. Edin.,

Deputy Medical Superintendent, Birkenhead Municipal Hospital.

August 23rd.

ACRIFLAVINE FOR SCHISTOSOMIASIS

To the Editor of THE LANCET

SIR,—Dr. A. C. Fisher's proposal in your issue of April 28th to treat schistosomiasis with acriflavine has stimulated many medical centres in Egypt to try it. To my surprise all of them treated their cases with trypaflavine with the idea that it is a synonym of acriflavine, and their failure may be attributed to this fact and to different dosage. Trypaflavine is a yellow powder with the formula 3:6 diamino-10-methylacridine chloride; acriflavine is a brick-red powder with the formula 2:8 diamino-10-methylacridine chloride. I am using a big bed-time dose of acriflavine—30 c.cm. of a 2 per cent. solution in water for adults weighing over 60 kilos, 15 c.cm. for youngsters and boys weighing 25–35 kilos, and 5 c.cm. for young children weighing 10–20 kilos. With these doses vomiting occurs in 40 per cent. of the cases but only ten hours after the dose has been given. Even very weak and debilitated patients stood this dose well; vomiting and some diarrhœa occurred, but there were no colicky pains or jaundice. Among 100 cases so treated over 50 per cent. are cured—ova absent or all dead. It is rather too early to speak about ultimate results. I am treating with encouraging results cases rejected by the Bilharzia Hospital as unfit for tartar emetic because of heart failure, liver cirrhosis and insufficiency, kidney troubles, or advanced anæmia. Some of the cases were treated in hospital, but the majority at home without special precaution.

Acriflavine is so quickly absorbed by the intestinal mucous membrane that little of it reaches the rectum where the worms may carry on. This led me to give rectal enemas, 300 c.cm. of a 1 in 500 solution every night, and it was when the drug was excreted in the urine curing bilharzia both of rectum and bladder. This route of treatment is suitable for

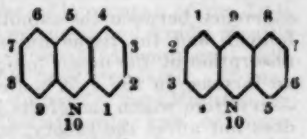
cases which vomit badly and refuse oral treatment on this account. Recently I have been trying salol-coated or keratin-coated pills, with extract of gentian as the vehicle.

I am, Sir, yours faithfully,

M. A. EL MONEIM EL DIWANY,
Principal Medical Officer, Shebin-el Kom General Hospital, Egypt.

July 30th.

*** Our correspondent is not correct in regarding trypaflavine as in any way essentially different from acriflavine. The confusion is due to the unfortunate fact that two systems of numbering have been employed to indicate the positions of substituted groups in the acridine molecule. The method of enumeration recognised by the B.P. 1932 is that given in Richter's "Lexikon der Kohlenstoff-Verbindungen," and shown in Formula I. An alternative method used—notably in France and in America (U.S. Dispensatory 1926)—is given in Formula II.



The variation in colour to which our correspondent refers may be due to the fact (of which we are informed by Messrs. May and Baker Ltd.) that commercial samples of these products consist of a mixture in varying proportions of the hydrochlorides of diamino-methyl-acridinium-chloride and diamino-acridine; which may also explain the differing therapeutic results.—ED L.

VACCINES IN PEPTIC ULCER

To the Editor of THE LANCET

SIR,—During the past few years the view that gastric and duodenal ulcers are due to an intestinal infection has slowly gained ground. Prof. D. P. D. Wilkie,[1] of Edinburgh, has demonstrated similar streptococci in the walls of the ulcer and gall-bladder in the same case. Dr. A. F. Hurst [2] has noted that duodenal ulcer is almost always associated with constipation. In the handbook of Vaccine Therapy,[3] issued by Parke Davis and Co., written by members of the Inoculation Department of St. Mary's Hospital, it is stated that long-chained non-hæmolytic streptococci are always present in cases of gastric and duodenal ulcer, and that these streptococci are not a normal inhabitant of the bowel.

Working with the vaccine prepared from these streptococci, during the past 18 months I have been able to demonstrate the fact that in a series of 22 cases the patients were hypersensitive to this vaccine—intestinal streptococci—to a remarkable degree. As a general rule a dose of 100 organisms is sufficient to cause a serious reaction. In fact, after a few of these reactions I have been compelled to commence with a smaller dose—20 or even 10 streptococci—and to make increases in this small initial dose every two or three days until improvement or reaction follows. Once there is a definite improvement the dose is cautiously increased until the improvement lasts for about a week, and the same dose is then administered at weekly intervals without any attempt to increase it unless the favourable response becomes shorter in duration. If a reaction follows any dose, a week is allowed to elapse and the next dose is drastically reduced, according to the severity of the reaction.

It is almost unbelievable to anyone who has not tried it that these doses should produce such marked results. One can only suppose that the result is produced by some kind of allergic response in a body sensitised to this particular bacterial poison. In actual practice the difficulty with these minute doses is not that they are without effect, but that they produce too violent reactions. The patients are, in my experience, hypersensitive—not only in the stage when an actual ulcer has been demonstrated by the X rays, but also before such ulcer can be demonstrated by the X rays, and after the ulcer has clinically healed. I have also found—as one would expect, according to the infective theory—that in the small number of cases I have tested, this hypersensitiveness to these intestinal streptococci is present in every case of chronic appendicitis and cholecystitis, and the common clinical complaints of "heartburn," "waterbrash," and so-called gastritis. The theory that these are all local exhibitions of one underlying streptococcal infection seems to be correct, and vaccine therapy is worthy of an extended trial with a larger series of cases.—I am, Sir, yours faithfully,

Tutbury, Staffs, August 20th. J. N. GALE.

[1] Brit. Med. Jour., 1933, ii., 767.
[2] In Price's Text-book of Medicine, London, 4th ed., p. 582.
[3] Vaccine Therapy, Parke Davis and Co., 1931, p. 62.

PERSPIRATION SENSIBLE AND INSENSIBLE

To the Editor of THE LANCET

SIR,—In his first Lettsomian lecture, published in your last number, Dr. C. E. Lakin has defined insensible perspiration as "the escape of water vapour by osmosis through the skin. It is thought," he adds, "that the sweat glands play no part at all in this process." Hancock, Whitehouse, and Haldane (Proc. Roy. Soc. B., 1930, cv., 43) say that the loss of water by evaporation of water which has permeated through the general surface of the skin, and by evaporation or trickling down of sweat secreted by sweat-glands, does not necessarily correspond with what is known as insensible and sensible perspiration. They write:—

"In dry moving air or air at the low atmospheric pressure of a high altitude, evaporation from the skin may be so rapid that when the sweat-glands are secreting very actively, or even to their utmost capacity, the general surface of the skin may be dry, so that all the perspiration is insensible, though far the greater part of it is due to secretion of sweat."

The condition of sweating was recently dealt with by Prof. B. A. McSwiney in his Samuel Hyde lecture to the Royal Society of Medicine (see THE LANCET, 1934, i., 641). It seems to me that Dr. Lakin's use of the term "insensible" perspiration is confusing. The term refers to the condition where there is no visible sweating; but under certain conditions even though the sweat-glands are secreting actively perspiration appears to be insensible.

I am, Sir, yours faithfully,

J. T. IRVING.

The School of Medicine, Leeds, Sept. 4th.

JOHN KNIGHT, SERJEANT SURGEON

To the Editor of THE LANCET

SIR,—The distinguished royalist, Dr. John Knight, is the leading figure in an historical paper which I am endeavouring to complete. Dr. Knight was made serjeant surgeon by Charles II. and appointed to be the King's principal surgeon. He was also commissioned by the same sovereign to be surgeon general of the Forces, and in that character did service in arranging for the care of the sailors wounded in the sanguinary naval battles fought off the East Coast in the second and third Dutch wars, and for the care of the sick soldiers engaged in the expedition to the Spanish Netherlands in 1678.

For the purpose of my paper I am seeking informa-

tion bearing upon the history of the office of serjeant surgeon. An interesting article upon the serjeant surgeoncy appeared in the *Medical Times and Gazette* of Oct. 19th, 1867; oddly enough the article does not name Dr. John Knight among the holders of the office. It occurs to me that other articles upon the subject of the office must have been published from time to time and particularly upon occasions when distinguished surgeons in modern times have received the Royal Grant which appears to be conferred by letters patent.

The importance, the dignity, and the antiquity of the office alike suggest that some book may have been written about it giving, amongst other things, biographical material concerning the holders of the serjeant surgeoncy from early times.

I am, Sir, yours faithfully,

August 31st. E. M. C.

PANEL AND CONTRACT PRACTICE

Amendments to the Regulations

THE Insurance Acts Committee has been considering the draft of the new consolidated edition of the medical benefit regulations, which contains certain amendments of existing procedure. The first of these deals with excessive prescribing. At present an insurance committee "shall make a recommendation" to the Minister about the withholding of money, even in cases where it has been found that excessive cost of prescribing has not been established. It is now proposed to insert after the word "shall," "if such decision is that excessive cost has been imposed upon the funds available for the provision of medical benefit." The second amendment concerns the procedure to be adopted when questions as to scope of the service are submitted to referees under the Act. The Ministry have agreed to the two modifications suggested at the last panel conference. The third amendment deals with arrangements for practice on retirement or death. The present wording states that "the representative of a deceased practitioner may *within the period for which the committee may permit the practice to be carried on by a deputy* require the committee to give notice, &c. . . ." It is agreed to alter the italicised words to "*within any period for which the committee shall have permitted.*" This is to make it clear beyond doubt that in the case of the death of an insurance practitioner the right to nominate a successor to the practice under this clause does not extend to a period of (say) two months, if no deputy has been appointed. The fourth amendment deals with the period within which, after fees have been accepted for services outside the Act, form GP 45 has to be submitted; at present only two days are allowed, and the time is to be extended to seven days. The fifth amendment concerns the arrangement for carrying on a practice during a practitioner's absence. At present the practitioner is required to inform the committee of the nature of any standing arrangements made with any other practitioner or practitioners, but does not require him to make such deputising arrangements. The new clause makes this quite clear: "A practitioner shall make all necessary arrangements for securing the treatment of his patients where he is unable for any of the causes mentioned above to give treatment personally, and shall inform the committee of any standing arrangements for that purpose."

Agreement on Certification

As a result of conferences up and down the country during the year, culminating in a central conference convened in March, agreement has been reached between approved societies and the Insurance Acts Committee on various points of difficulty in certifying incapacity. The agreement requires no alteration of regulations, but will only become effective through general adoption by both sides. The Ministry of Health, whilst appreciating the efforts of both sides to solve their difficulties, will insist on the proposals going to the consultative council for approval. The resolutions relating to the certification of pregnancy have already been set out in these columns (1934, i., 919); further resolutions on final certificates are now to be submitted to the conference. Postdating by three days is to be allowed in urban as well as rural areas; any alteration on certificates should be initialed to aid in detecting unauthorised alteration of dates. With regard to industrial diseases the resolution suggests that, although insurance practitioners are not required to decide whether an incapacitating disease is occupational or not, the note "? occupational" might be added to the certificate whenever the practitioner is of opinion that the character of the patient's employment may be a contributory or causative factor. For alternative employment the practitioner may communicate with the society intimating his opinion that the time was approaching when the member might be capable of some other kind of work, and asking what the society proposed to do in the matter. Of special interest is the suggested letter to be sent to doctors by secretaries of approved societies on the question whether a reference to the regional medical officer is desirable. The letter runs:—

DEAR SIR,

re ——————————————————

——————————————————

Serial No. ——————

The above insured person is a member of our society, and is receiving from you certificates of incapacity for work.

After a review of the case we are considering the reference of our member for examination by the regional medical officer, but in order to prevent unnecessary reference to this officer we shall be obliged if you will be good enough to inform us by return of post if a final certificate has been issued by you, or is likely to be issued by you in the next few days.

We realise that there is no obligation upon you to supply information to us, but it is hoped that in the interests of all concerned you will favour us with a reply.

To save you trouble we have made provision below for your reply, and we shall be grateful if you will use this and return the entire form in the enclosed envelope.

Yours faithfully,

Secretary.

Dr. ——————————————————

——————————————————

I issued a final certificate on ——————

Do you consider that any advantage would be gained by a reference to the R.M.O.? ——————

Any other observations which you may wish to offer the society.

——————————————————

——————————————————

——————————————————

Signature ——————

The form of this letter, as also the previous resolution on alternative employment, appear at first sight to be so obvious a method of dealing with the situation that one asks immediately why it has not been adopted before. The answer is professional secrecy—and this difficulty is still present. The relationship of doctor and patient is such that without the patient's consent the doctor cannot answer such letters from an approved society. He can send a report, as he does now, to another medical man who is to give an opinion on a particular case, because those reports are confidential and are not disclosed to the society

that is making the reference. The R.M.O.'s report is made to the society as a result of his own examination of the case, and with the help of the information conveyed in the medical attendant's report.

The report of the Insurance Acts Committee does not say whether legal opinion has been taken on the matter. It is obvious that if an insurance practitioner did communicate to an approved society facts about a patient without his consent which resulted in losing benefit, that quite clearly would be a breach of professional secrecy. On the other hand, these communications about patients might be answered in secrecy. But is it the I.A.C.'s considered policy to ask the conference to sanction secret communication about patients between the attending doctor and the society's officials? At the present time the difficulty is surmounted by marking the certificate confidential and handing it to the patient. This method could be adopted by sending to the patient the letter asking for the doctor's report. He would then know what was taking place, and by sending it himself to the approved society he would absolve the doctor from the breach of professional secrecy. With regard to the information sought by this letter, while it may help the society to know that a final certificate has been issued, few doctors and fewer patients will think there is anything to be gained by a reference. The patient may resent the suggestion that his doctor does not know all about his case, and will certainly dislike the implication that he is drawing sickness benefit when he ought to be back at work. The doctor in most cases will simply regard the reference as another report to write.

OBITUARY

ERIC DANVERS MACNAMARA, M.D. Camb., F.R.C.P. Lond.

Dr. E. D. Macnamara, who died in London on August 24th after a short illness, was educated at Peterhouse, Cambridge, where he took his B.A. in 1890, and at the Westminster Hospital from which he graduated L.S.A. in 1895 and M.R.C.S. in 1897. He then entered the medical department of the Royal Navy, serving in the Boxer rising, and being present at the relief of Peiping, for which he was awarded a medal with clasp. After five years service he returned to civil practice as medical registrar at the Westminster Hospital, taking the higher medical diplomas, and becoming assistant physician to the hospital, lecturer on medicine in the medical school, and finally dean of the school. During this period he was for a short time physician to Paddington Green Children's Hospital, and began the association with the West End Hospital for Nervous Disease which lasted throughout his life. In 1912, shortly after being elected F.R.C.P., he resigned his appointments at Westminster to succeed C. A. Mercier as physician for mental diseases to Charing Cross Hospital, and lecturer on psychological medicine in the college. He lectured also at Bethlem Royal Hospital, examined in psychology for the Conjoint Board and the University of London, and was a visitor for Middlesex under the Mental Deficiency Act. During the war he served in the medical department of the Admiralty as well as in the R.A.M.C. When increasing private work led him to give up his Charing Cross appointment he still remained active on the staff of the West End Hospital.

Although always more interested in psychopathology and psychiatry than organic neurology, Macnamara was nevertheless a very sound neurologist and diagnostician. His early experiences as assistant physician at Westminster had given him a wide knowledge of general medicine which enabled him to take a sound view of his special subjects and his individual cases. He was the author of no textbook but he was a frequent writer on neurological and psychological subjects to medical journals. He contributed to Latham and English's "System of Treatment" articles on morphinomania and insomnia; to the "Dictionary of Practical Medicine" articles on general paralysis, alcoholism, and functional insanity; and to Price's "Text-book of the Practice of Medicine" the article on psychological medicine. Everything he wrote had a distinction of style and an easy competence which made reading a pleasure.

Macnamara's personal qualities endeared him to his friends. Beneath his unassuming, somewhat reserved manner lay a charming personality and one of ready sympathy. "One could always," a colleague writes, "talk over difficulties with Macnamara, and be sure of common sense and helpful advice. Much of his work at the hospital was unobtrusive and entirely unselfish. He would serve on committees without demur, and on the committee of management of the hospital his services were invaluable. Although cautious in his decisions and somewhat conservative in his ideas, he had a vein of humour which belied his grave demeanour." A colleague in the R.N. medical service who remained a lifelong friend also testifies to the ability and sympathy which Macnamara possessed and devoted in such full measure to the department of medicine which he made his own. To an extensive knowledge of men and matters he added an enjoyment of life and an outlook on affairs which made him a delightful companion. It is, he adds, no exaggeration to say that Macnamara's name and work will long be remembered with gratitude by patients, students, and colleagues alike.

Dr. Macnamara married in 1904 Frances Mary, daughter of the late Dr. W. Simpson Craig, and sister of Sir Maurice Craig. He leaves a widow and two sons.

DAVID DUNCAN MAIN, F.R.C.P., F.R.C.S. Edin.

Dr. David Main, formerly principal of the Hangchow Medical Training College, who died at Buxton on August 30th, was an Ayrshire man, being born at Kirkmichael in 1856. At the age of 16 he entered a shipping business in Glasgow, but under the inspiration of Moody and Sankey he later decided to work as a missionary, and in 1877 he went to Edinburgh to prepare himself for the work by becoming a doctor. He qualified in 1881, and with his wife was immediately sent to Hangchow, where he served for 46 years. In spite of political disturbances, when the station either had to be closed down or work was carried on under military protection, when hospitals had to be given over to wounded and Red Cross services mobilised, Dr. Main created one of the finest medical organisations of the mission field. His work among the lepers, the opium addicts, and those suffering from tuberculosis led him to obtain the funds to found hospitals for patients suffering from these diseases. His care for the general health of the population called into being a home for incurables, convalescent homes, a maternity hospital, and a mental hospital.

He was eager that Chinese doctors and nurses should be trained, and so there were schools for midwives and dispensers, for male and female nurses, and in 1924 a gift of £10,000 from Lord Maclay enabled him to open the Hangchow Medical Training College, accommodating 135 resident students, with a staff of 25 foreign and Chinese teachers and doctors. At the close of his service there were 500 beds at the station instead of 16. Over 4000 in-patients and 60,000 out-patients were treated in a year, and over 1000 major operations performed. The institution was aptly called in Chinese the Hospital of Universal Benevolence. In 1926, at the time of Dr. Main's retirement, there were serious uprisings against foreigners, and in 1927 the whole work had to be closed down; but 18 months later it was possible gradually to open it up again.

Dr. Main's translations into Chinese include Whitla's "Dictionary of Treatment," Caird and Cathcart's "Surgical Handbook," and Playfair's "Midwifery." His years of retirement were spent in Edinburgh.

MEDICAL NEWS

Microchemical Club

The second meeting of this club will take place at Reading on Sept. 29th. At 11 A.M. the club will meet at the University for the discussion of papers, while in the afternoon a visit will be paid to the National Institute for Research in Dairying, Shinfield. The hon. secretary may be addressed at that Institute.

St. Mary's Hospital

A post-graduate course open to all medical practitioners will be held in this hospital from Friday, Sept. 28th, to Sunday, the 30th. The annual dinner for past and presen students will take place in the library of the new medica school, adjoining the hospital, on Saturday, Sept. 29th, at 7 for 7.30 P.M. The chair will be taken by Dr. P. Montague Smith.

National Children's Home and Orphanage

Dame Janet Campbell, M.D., will open a new wing at the Sanatorium, Harpenden, on Saturday, Sept. 22nd, at 2.45 P.M. Sir Thomas Barlow, M.D., F.R.S., who has just celebrated his eighty-ninth birthday, is to take the chair.

St. George's Hospital

A post-graduate course for old students has been arranged by this hospital, and will be held from midday on Friday, Sept. 28th, till midday on Monday, Oct. 1st. Dr. W. Langdon Brown, regius professor of physic in the University of Cambridge, will deliver the inaugural address and present the prizes in the board room at 3 P.M. on Oct. 1st. The address will be entited "We have Reason to Think," and Sir Humphry Rolleston is to preside. The annual dinner will be held at Claridge's Hotel on Saturday, Sept. 29th, at 7.15 for 7.45 P.M., with Mr. W. Fedde Fedden in the chair.

Fellowship of Medicine and Post-Graduate Medical Association

A lecture-demonstration will be given by Dr. Clark-Kennedy at the Medical Society of London, on Tuesday, Sept. 11th, at 2.30 P.M., and will deal with chronic cough. On Sept. 18th he will lecture on hemiplegia. There will be a "refresher" course in medicine, surgery, and the specialties at the Westminster Hospital, from Sept. 17th to 29th. Other forthcoming courses include diseases of the chest at the Brompton Hospital, and proctology at the Gordon Hospital, both from Sept. 24th to 29th; diseases of children at the Queen's Hospital, Oct. 1st to 13th; dermatology at St. John's Hospital, Oct. 1st to 27th; an evening course on physical medicine at the St. John Clinic and Institute of Physical Medicine, Oct. 1st to 27th; cardiology at the National Heart Hospital, Oct. 8th to 20th; and medicine, surgery, and the specialties at the Metropolitan Hospital, Oct. 8th to 21st.

Kirk Duncanson Research Fellowship

The council of the Royal College of Physicians of Edinburgh will shortly award a whole-time fellowship of £300 per annum to a research worker. A part-time fellowship of £100 a year will also be awarded. Applications should be sent to the secretary of the college, 9, Queen-street, Edinburgh, not later than Sept. 15th. Particulars appeared in our advertisement columns last week.

Instruction in Contraceptive Methods

A lecture on the Theory and Practice of Contraception will be given to medical students and practitioners by Dr. Gladys Cox on Friday, Sept. 14th, at 6 P.M., at the Walworth Women's Welfare Centre, 153A, East-street, S.E.17. Practical demonstrations will be given on Fridays, Sept. 21st and 28th, at 6 P.M. and 7 P.M. These courses are given under the auspices of the Society for the Provision of Birth Control Clinics; they are open to students who have completed their gynæcological course and to medical practitioners, and to cover expenses a fee of 5s. is charged. Tickets for the lectures are to be applied for in advance, and those wishing to attend are asked to indicate as soon as possible the day and time they propose to attend.

A number of lectures on the theory and practice of contraception will also be given this autumn at the North Kensington Women's Welfare Centre, 12, Telford road, London, W.10. The first lecture for post-graduates will be given by Dr. Cecile Booysen on Friday, Sept. 14th, at 5 P.M., and the first lecture for medical students by Dr. Helena Wright on Monday, Sept. 24th, at 5.30 P.M. Dates of demonstrations will be arranged at the lectures, and a fee of 5s. will be charged. Particulars of later lectures and other information may be had from the secretary of the clinic.

Medical Diary

SOCIETIES

PADDINGTON MEDICAL SOCIETY.
TUESDAY, Sept. 11th.—9 P.M. (Great Western Royal Hotel, Paddington, W.), Dr. L. Zeitline: Medical Humour.

MEDICAL OFFICERS OF SCHOOLS ASSOCIATION.
SATURDAY, Sept. 15th.—10 A.M. (Town Hall, Grove-road, Eastbourne), Dr. J. Alison Glover and Dr. Fred Griffith: Acute Streptococcal Throat Infections.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, London, W.
MONDAY, Sept. 10th, to SATURDAY, Sept. 15th.—INFANTS HOSPITAL, Vincent-square, S.W. Course in Infants' Diseases. Afternoons.—MEDICAL SOCIETY OF LONDON, Chandos-street, Cavendish-square, W. Lecture-demonstration by Dr. A. E. Clark-Kennedy on Chronic Cough, at 2.30 P.M., on Tuesday, Sept. 11th.—PANEL OF TEACHERS: Individual clinics in various branches of medicine and surgery are available daily.—Courses of instruction, clinics, &c., arranged by the Fellowship of Medicine are open only to members and associates.

Appointments

BAILEY, R. H., M.R.C.S. Eng., has been appointed Registrar and Clinical Pathologist to the Children's Department of the Westminster Hospital.

GIBB, C. DE W., F.R.C.S. Edin., Honorary Ear, Nose, and Throat Surgeon at the Gloucestershire Royal Infirmary.

MUENDE, I., M.B., B.Sc. Lond., Physician in Charge of the Skin Department at the Willesden General Hospital.

STRØM-OLSEN, ROLF, M.D., B.Sc. Wales, D.P.M., Medical Superintendent of the East Ham and Southend Joint Mental Hospital, Runwell, Essex.

Certifying Surgeons under the Factory and Workshop Acts: Dr. H. T. S. WISE (Chesham, Bucks); Dr. G. FOSTER SMITH (Loughton, Essex); Dr. A. McD. MACGREGOR (Epworth, Lincolnshire); and Dr. J. W. MACLEAN (Newton Stewart, Wigtownshire).

Births, Marriages, and Deaths

BIRTHS

FOX.—On August 30th, at Guernsey, the wife of Maurice D. Fox, M.D., of a daughter.

DEATHS

MAIN.—On August 30th, suddenly, at Buxton, David Duncan Main, F.R.C.S. Ed., F.R.C.P. Ed., late of Hangchow, China.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

NOTES, COMMENTS, AND ABSTRACTS

OLD AGE*

BY HORACE C. COLMAN, M.D.

No satisfactory definition of old age has been produced. Whatever our age may be, we feel that old age is many years ahead; but for a working formula nothing is better than the Psalmist's three score years and ten. The patients I am thinking of are mostly those who have passed that milestone and yet show no signs of incapacitating disease. Even in these days of wandering after false gods or from consultant to consultant, there are still whole families whom we may regard as patients, our patients, well or ill. These old patients form no inconsiderable proportion of our visiting list, for among them are many who, though not obviously ill, like a regular visit from their family doctor; and that is a cause for thankfulness in every way.

You will agree with me that visits to old patients are often those you look forward to enjoying, and that from them you have learned a great deal not only medical, but of life in general. These people do not expect miracles, and most of them are very grateful for anything you do for them. All this applies to some in the humblest circumstances as much as to the better-off.

In my young days I learned something very valuable from a dear old lady. It was thought well that I should be introduced to her when she was not really ill. At the end of our consultation she said, "Well, I think you are quite a nice young doctor, but how times have changed! When I was younger, my doctor always felt my pulse and looked at my tongue." When we start practice fresh from hospital and a surfeit of acute illness we may very likely feel that old people and their ailments do not matter much; we may think that very little can be done for them, and that very little can be learned from them. It is well if we discover our error early.

One old lady once said to me, "You will find that your patients, when they get past 70, do not behave in illness in the way you would expect." Experience has proved this to be true. Do we not often see an old patient successfully go through an illness which by all the rules should have been fatal; or another resist for a long time the attack of some illness that ought rapidly to have proved fatal? On the other hand, some apparently trivial ailment has rapidly ended life, almost before one had realised that the patient was ill.

Patience and Prophecies

What can we learn from our old patients? Not all of them are dear old things. Some are very much the reverse, and from them we have to learn patience while they recite their tale of woe and their list of grievances. I have a vivid recollection of one old man who had been extremely successful in business, and who had everything that would make his declining years comfortable and happy. Yet he could find no pleasure in anything but reciting his woes, and seemed possessed by a grievance against Providence that such a man as he should be allowed to grow old. He kept a diary. I had to listen weekly to the details of his functions for the previous seven days, the amount of sleep, the exact hour at which he waked, and the biscuit he ate on waking, &c. Nothing would persuade him to take a favourable view of anything. One could only endure with patience and be thankful that one only visited him and did not dwell with him. A visit could not be terminated in less than 30–40 minutes, and one left feeling that at least that fee was earned.

One can learn also never to prophesy too confidently about the future, and to remember that mistakes in treatment are more easily forgiven than mistakes in prognosis. I had long promised an old man that, should he ask me if he were going to die, I would give a truthful answer. The test came when he was nearly 90 and ill with pneumonia, with a high temperature, respirations of 48, and pulse 140. To his question I replied that I did not think that he could possibly live 48 hours. The prospect pleased him so well that he improved from that hour, and he lived another four years. One can learn never to give up hope.

A question that is sometimes asked is whether we are ever justified in depriving a patient of hope. My own view is very seldom, unless it is obvious that adjustment of his affairs may save great distress to those who are left behind. But when we do feel justified in buoying up our patient's hopes, we should take some near relative into our confidence.

Even the most desperate cases recover sometimes. One old woman always protested when her daughter sent for me that it was nonsense sending for me as she was a done old hulk, and ought to be allowed to die. When sent for when she was 88 I found her with a complete obstruction. I told the daughter that an operation might save her life, and in any case would make her end easier. I said I thought she should have the chance, though I felt sure she would not take it. The daughter agreed with me, and was sure she would not take her chance. The old lady was lying in an old-fashioned box bed and was very deaf. There was nothing for it but to climb into the bed and practically to lie down beside her and bellow into her ear. Like a shot she replied, "Well, if you think so, you had better get it done at once." The daughter collapsed into a chair behind me, but I am glad to say the old lady spent 11 days in hospital and returned home to enjoy a year of complete comfort before influenza quietly removed her.

One can learn also to admire and respect an indomitable spirit rising supreme above poverty and real hard work.

An old woman had known poverty so extreme that she and her brothers and sisters gathered wool from the hedges for her mother to spin, and gleaned in the cornfields and kept the straw for their mother to make hats for them, married a widower who developed locomotor ataxia and went blind. She nursed that man, led him about, and in his old age catheterised him for seven years, kept pigs and hens, and took in washing, and for many years never had more than three consecutive hours' sleep in bed. To the end, which came when she was 87, she kept up a cheerful outlook on life that made friends for her all round, and I am glad to remember that she had a few years of peace and quiet after she buried that unfortunate husband.

Management of Old Age

Now, let us turn to what we can do for our old patients. We can do a great deal, both in the way of helping them to keep well, and when obviously in their last illness by making their remaining life tolerable.

To illustrate my last point I may refer to an old woman who came into my hands lately. I found an emaciated patient with a very sore mouth, diarrhœa, a foul discharge, and ulcerated skin, altogether in utter misery. Examination showed a large rectal cancer and a recto-vaginal fistula. Douching and an ointment at one end and a simple treatment of the mouth, together with opium, to which I shall refer later, converted a miserable, querulous woman to a placid contented invalid, who died peacefully and without distress. Incidentally she developed a painless gangrene of a toe, and I have discovered that the two affections are often associated.

Old people, when they are feeling in good form, like to kick over the traces occasionally, and often the best thing we can do for them is to protect them from too fussy relatives. Even if they get thoroughly

* A presidential address to the Forfarshire Medical Association at its June meeting, 1934.

tired out, they have enjoyed themselves, and after a good rest are seldom the worse.

Probably we can all think of delightful pranks played by cheery old people on their protectors. One of the most amusing I know is told of a distinguished member of our profession, equally distinguished as an artist, who had retired to Hampshire in his old age. One lovely day in June his wife and daughter settled him comfortably in the garden, with everything that he could need, and then trotted off for a day in town.

No sooner were they gone than away went the rugs, and the old gentleman was busy at the telephone fixing up three cronies for lunch and whist at his club. The next train carried him to London too. After a joyful day he watched his wife and daughter get into the train, slipped into another compartment, and met them at the ticket barrier, expressing the hope that they had had as good a day as he had.

Of course, many of these active old people need advice as to the extent of their activities, and most of them are amenable to reason. The motor-car has displaced the horse, but the suggestion that they should treat themselves as they would a favourite old horse, and after a good day's work give it two days in the stable, will still appeal to some.

One matter in which old people are apt to become careless is attention to the bowels. It may be safely asserted that very few people have reached a great age who were careless on that point. Nowadays old and bedridden people undoubtedly live longer than they did, and owe this to skilled and conscientious nursing, and to meticulous attention to the skin and bowels. As a general rule we may leave this to the nurses, but even they are fallible, and it is advisable to see periodically that all is well there. On the other hand, we come across old people who are overwhelmed with an obsession about their bowels and make their own and other peoples lives a burden. Here we have to call up all our tact and skill to guide their thoughts into other channels.

Sleep

Sleeplessness is another trouble of old age. The old undoubtedly need much less sleep than young, but it is very irksome to toss about in bed half the night hoping to get sleep. In many cases, if it be made clear to our old patients that they do not need the sleep of youth, and that the mere rest in bed is doing them good, they worry less about falling asleep and therefore obtain more. I see no reason why they should not read in bed. The prejudice against this very pleasant recreation probably arose from the danger of the nodding night-cap catching fire at the candle, with dire results; but with an electric lamp no harm can come from that direction.

Another very valuable aid to sleep is to adjust the times of taking food. Here our patients differ markedly. One cannot sleep if he goes to bed hungry, and another must not take anything for two or three hours before wooing asleep. Most of them find, however, that sleep comes more readily if a hot drink be taken, and this is best taken after getting into bed. The composition of the drink does not matter much so long as it is hot; the patient's own taste should settle what he drinks. Many elderly folk find they can get off to sleep quite readily but wake up in an hour or two, and find difficulty in getting off again. Here a little food, such as a biscuit and milk, taken on waking up, is very often successful in getting them asleep again.

I cannot resist telling of one patient to whom I suggested a little food in the night as an aid to sleep. Some time after he had accepted my suggestion, and when he was in good health again, I was shown the tray going up to his bedroom for the night. It contained a thermos flask of soup, half a partridge with trimmings, and a dish of cheese, biscuits, and celery.

The old often obtain their soundest sleep in the morning, and here a judicious rearrangement of bedrooms, dealing with domestic noises, and with the effervescent spirits of the milk and paper boys, will often add hours to an old patient's sleep.

The Virtues of Opium

Of drugs to help sleep these are legion. We have all our favourites, and I do not propose to discuss them here. But what disappointing things they are. Earlier in this paper I said I would refer to opium again. Old people usually stand opium well and benefit from its judicious use. I do not think that it is consumed in the quantity it used to be. In my boyhood I lived on the edge of the fen country, where malaria was once very prevalent. I saw there, in hospital, a man who had suffered from malaria for many years and died of it, and who had never left the district. In the town on market days the chemists had a large sale of 1-oz. bottles of laudanum, which was the domestic remedy for fever of any description in the fen parishes. And I do not know that many people were any the worse for it.

Opium is a blessing in old age for some conditions, and above all for inoperable cancer. I remember Prof. Chiene, of Edinburgh, saying, apropos of inoperable cancer, "Gentlemen, turn them into opium eaters." To all of us come sooner or later cases of malignant disease which are past the surgeon's aid. Here is a field for the judicious use of opium. I mean opium in either pill or tincture, not any alkaloidal derivative. Put these cases on a small dose as soon as it is decided that operation is impossible, and it is surprising how slowly the dose requires to be increased to keep the patient free from pain and discomfort. Given thus, it seldoms gives any digestive trouble, constipation, or other ill-effects. Your patient will slowly subside from weakness and exhaustion, but not in pain or misery.

In conclusion, may I say that I hope we may all reach old age, that it may be a peaceful contented time for us, and no undue burden to those around us.

AGRANULOCYTOSIS AFTER ANTISYPHILITIC TREATMENT

In reporting a case of agranulocytosis following treatment with novarsenobenzol (Neosalvarsan) and bismuth P. Brouwer and F. Klein (Nederland, tijdschr. v. geneesk., 1934, lxxviii., 2757) point out that this is not a very rare sequel and recommend periodical blood examinations during such treatment, so that the drugs may be discontinued on the first sign of leucopenia. Their patient, a man aged 41, was admitted to hospital after having been ill for over six months with fever, sore-throat, and severe pains in the joints. There was no history nor sign of syphilis, and the Wassermann reaction was negative. Nevertheless, since investigation failed to discover any other cause for the symptoms it was determined to try antisyphilitic treatment. The blood count at this time was normal. A course of weekly injections of neosalvarsan and bismuth was begun and continued for 12 weeks. The symptoms were entirely relieved, and the patient resumed his work at the sixth week. Ten days after the final injection he was readmitted to hospital desperately ill, with continuous nose-bleeding, a generalised petechial rash, and signs of heart failure, and died in 12 hours. No post-mortem examination was permitted, but blood examination made before death revealed a total leucocyte count of only 1400 per c.mm. with complete absence of granular leucocytes.

A NEW TYPE OF BANDAGE

Mr. G. Nicholson, surgeon to the Tiverton Hospital, Devon, calls our attention to a new bandage material which deserves further trial. The fabric, which was originally submitted to him by a lace factory in the West of England, is an open cotton net with strands of elastic interwoven in such a way as to give elasticity in all directions and not merely in the long axis as is usual with other types of elastic bandage. On comparing its weight with other varieties he found that 7½ yd. by 3 in. of the new bandage weighed 3 oz., while the same length of elastic web bandage weighed

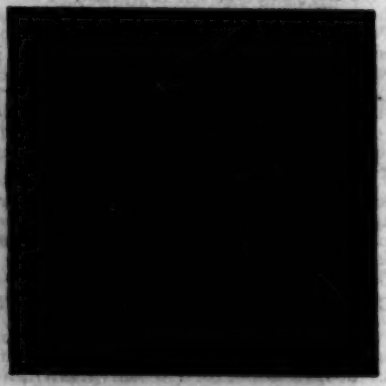
9 oz., and elastic crêpe bandage 3 oz. It is supplied in various widths.

The bandage has proved useful in retaining dressings in the axilla, on the neck, buttock, and groin with a minimum of discomfort to the patient. Under silk stockings the dressing is almost invisible. "It is particularly suitable in varicose veins," Mr. Nicholson adds, "because it is less bulky and more comfortable than an elastic stocking and has not the latter's disadvantage of becoming slack after a time. Also, in a narrow width, as a finger bandage, it will retain a dressing with a very little cotton-wool and so reduce interference with function to a minimum."

The London agent for the bandage, which is called "Lastonet," is the Medical Supply Association, of Gray's Inn-road, W.C.

MOVA AMPOULES OF NITRATE OF SILVER

WE have received samples of these ampoules from Mova Products, Ltd., 26A, Theberton-street, London, N.1, with full directions for their employment, and certain original testimonials as to the value which they have been found to possess in German clinics—for example, the Universitäts Frauenklinik of Berlin, the Deutsches Institut für Frauenkunde of Berlin-Charlottenburg, and the Landesfrauenklinik of Magdeburg. These testimonials are to the effect that the ampoules can be used for the prevention and treatment of ophthalmia neonatorum with safety and advantage. The accompanying illustration suggests the right method of placing the drops in the eyes of the infants. Both ends of the ampoule are broken off and the ampoule, with the bulge downwards, is emptied into the pipette which is at once closed with the finger. By lifting and pressing down the finger the falling of the drops can be regulated, and the contents of one ampoule usually suffice for both eyes.



We have received from the same firm an emollient lubricating preparation useful in eczema and herpes, the basis of which is extract of Hamamelis, and specimens of suppositories of analogous composition as remedial for hæmorrhoids.

Vacancies

For further information refer to the advertisement columns

Aberdeen City Mental Hospital, Kingseat, Newmachar.—Jun. Asst. M.O. £300.
Ashton-under-Lyne District Infirmary.—H.S. £150.
Birkenhead General Hospital.—Cas. Officer. At rate of £100.
Birmingham and Midland Eye Hospital.—Res. Surg. O. £200.
Birmingham Children's Hospital.—Asst. Res. M.O. £125.
Birmingham, Moseley Colony Certified Institution.—Jun. Asst. M.O. £350.
Blackburn Royal Infirmary.—Res. H.P. £175.
Bolingbroke Hospital, Wandsworth Common, S.W.—Res. M.O. £200.
Brighton, Royal Alexandra Hospital for Sick Children.—H.S. £100.
Bristol, Ham Green Hospital and Sanatorium.—Jun. Asst. Res M.O. £250.
Canterbury, Kent and Canterbury Hospital.—H.S. At rate of £125.
Central London Ophthalmic Hospital, Judd-street, W.C.—Asst. Surgeon.
Chelmsford and Essex Hospital.—H.S. At rate of £150.
Cheltenham General and Eye Hospitals.—H.P. £200.
Coventry and Warwickshire Hospital.—Res. Cas. O. £125.
Dartford Southern Hospital.—Res. Med. Supt. £1100–£50–£1350.
Derby, Derbyshire Royal Infirmary.—Cas. O. and Orthopædic H.S. Also H.S. for General Surgery, &c. Each £150.
Dewsbury and District General Infirmary.—H.S. £150.
Egypt, Ministry of Education.—M.O. for Girls' Schools. £E.40.
Epsom County Hospital.—Res. Asst. M.O. At rate of £250.
Evelina Hospital for Sick Children, Southwark, S.E.—H.P. At rate of £120.
Exeter, Royal Devon and Exeter Hospital.—Sen. H.S. £250.
Great Barrow, near Chester, East Lancashire Tuberculosis Colony. H.P. At rate of £100.
Great Yarmouth General Hospital.—H.S. £140.
Hampstead General and N.W. London Hospital, Haverstock Hill, N.W.—Cas. M.O. for Out-patient Dept. At rate of £100.
Harefield, Middx., County (Tuberculosis) Sanatorium.—Res. Asst. M.O. £400.
Hospital for Sick Children, Great Ormond-street, W.C.—H.P. and H.S. Each at rate of £100.
Hospital of St. John and St. Elizabeth, 60, Grove End-road, N.W.—Res. H.S. At rate of £75.
Hull Royal Infirmary.—3rd H. S. At rate of £150.
Infants Hospital, Vincent-square, Westminster.—H.P. £75.
Kidderminster and District General Hospital.—H.S. £150.
Leigh Infirmary, Lancs.—Res. H.S. At rate of £175.
Liverpool, David Lewis Northern Hospital.—Cas. O. At rate of £120.
Liverpool Royal Infirmary.—Three H.S.'s for Spec. Depts. Each at rate of £60.
Macclesfield General Infirmary.—Second H.S. At rate of £150.
Manchester, Ancoats Hospital.—Asst. Pathologist. £300–£350. Res. M.O. At rate of £150. H.P. At rate of £100. Also Med. Reg. £50.
Manchester Royal Eye Hospital.—Jun. H.S. £120.
Manchester Royal Infirmary, Radiological Dept.—Jun. Asst. M.O. £200.
Manchester, St. Mary's Hospitals.—H.S.'s. Each at rate of £50.
Manchester and Salford Hospital for Skin Diseases.—H.S. At rate of £100.
Margate Royal Sea Bathing Hospital.—Visiting Surgeon for Ear, Nose, and Throat. 25 gns.
Margate and District General Hospital.—Res. M.O. £150.
Market Drayton, Salop, Cheshire Joint Sanatorium.—Res. Asst. M.O. £350.
Mothers' Hospital, Salvation Army, Lower Clapton-road, E.—Jun. Res. M.O. At rate of £80.
Nelson Hospital, Merton, S.W.—Res. H.S. At rate of £100.
Newcastle-upon-Tyne, City Hospital for Infectious Diseases.—Res. Med. Asst. £350.
Northampton General Hospital.—Four Res. M.O.'s. Each £150. Also Sen. Res. M.O. £250.
North Middlesex County Hospital.—Jun. Res. Asst. M.O. At rate of £250.
Norwich, Norfolk and Norwich Hospital.—H.S. Also H.S. to Spec. Depts. £120.
Nottingham Children's Hospital.—Res. H.P. At rate of £150.
Nottingham City Mental Hospital.—Jun. Asst. M.O. £350.
Nottingham Hospital for Women.—H.S. At rate of £150.
Plymouth Central Hospital.—H.S. At rate of £150.
Princess Beatrice Hospital, Richmond-road, Earl's-court, S.W.—Res. M.O. At rate of £150. Also H.P. and Cas. O., and H.S. and Cas. O. Each at rate of £110.
Princess Elizabeth of York Hospital for Children, Shadwell, E.—H.P. and Cas. O. Each at rate of £125.
Queen Charlotte's Maternity Hospital, Marylebone-road, N.W.—Asst. Res. M.O. Also District Res. M.O. Each at rate of £80.
Radium Institute, Riding House-street, W.—H.S. At rate of £150.
Richmond, Surrey, Royal Hospital.—Jun. H.S. At rate of £100.
Royal Free Hospital, Gray's Inn-road, W.C.—Anæsthetic Registrar. £100.
Royal London Ophthalmic Hospital, City-road, E.C.—Sen. Res. O. At rate of £150.
Royal National Orthopædic Hospital, 234, Great Portland-street, W.—H.S. At rate of £150.
Royal Naval Dental Service.—Two Dental Officers.
St. Bartholomew's Hospital, E.C.—Registrar for Cancer Dept. £500.
St. Helen's Hospital.—Jun. H.S. £150.
St. John's Hospital, St. John's Hill, S.W.—Asst. M.O. £350.
St. Leonards-on-Sea, Buchanan Hospital.—Jun. H.S. At rate of £125.
Salford Royal Hospital.—Two H.S.'s and Cas. H.S. Each at rate of £125.
Samaritan Free Hospital for Women, Marylebone-road, N.W.—H.S. At rate of £100.
Scarborough Hospital and Dispensary.—H.S. At rate of £175.
Shrewsbury, Royal Salop Infirmary.—Res. H.P. At rate of £160.
Southend-on-Sea General Hospital.—H.S. At rate of £100.
Sunderland Children's Hospital.—H.S. £140.
Wakefield City.—Jun. Asst. M.O. for P.H. Dept. £500.
Warrington Infirmary and Dispensary.—Third Resident. At rate of £150.
Weir Hospital, Grove-road, Balham, S.W.—Sen. Res. M.O. £200.
West London Hospital, Hammersmith-road, W.—H.P. Also Two H.S.'s to Special Depts. Each at rate of £100.
Windsor, King Edward VII. Hospital.—H.S. At rate of £100.

The Chief Inspector of Factories announces vacancies for Certifying Factory Surgeons at Erith (Kent), Wolverton (Bucks), and Tavistock (Devon).

Medical Referee under the Workmen's Compensation Act, 1925, for the Oldham County Court District (Circuit No. 5). Applications should be addressed to the Private Secretary, Home Office, Whitehall, London, S.W.1, before Sept. 22nd.